Coal Age

DECEMBER, 1955

A McGRAW-HILL PUBLICATION—PRICE 50c

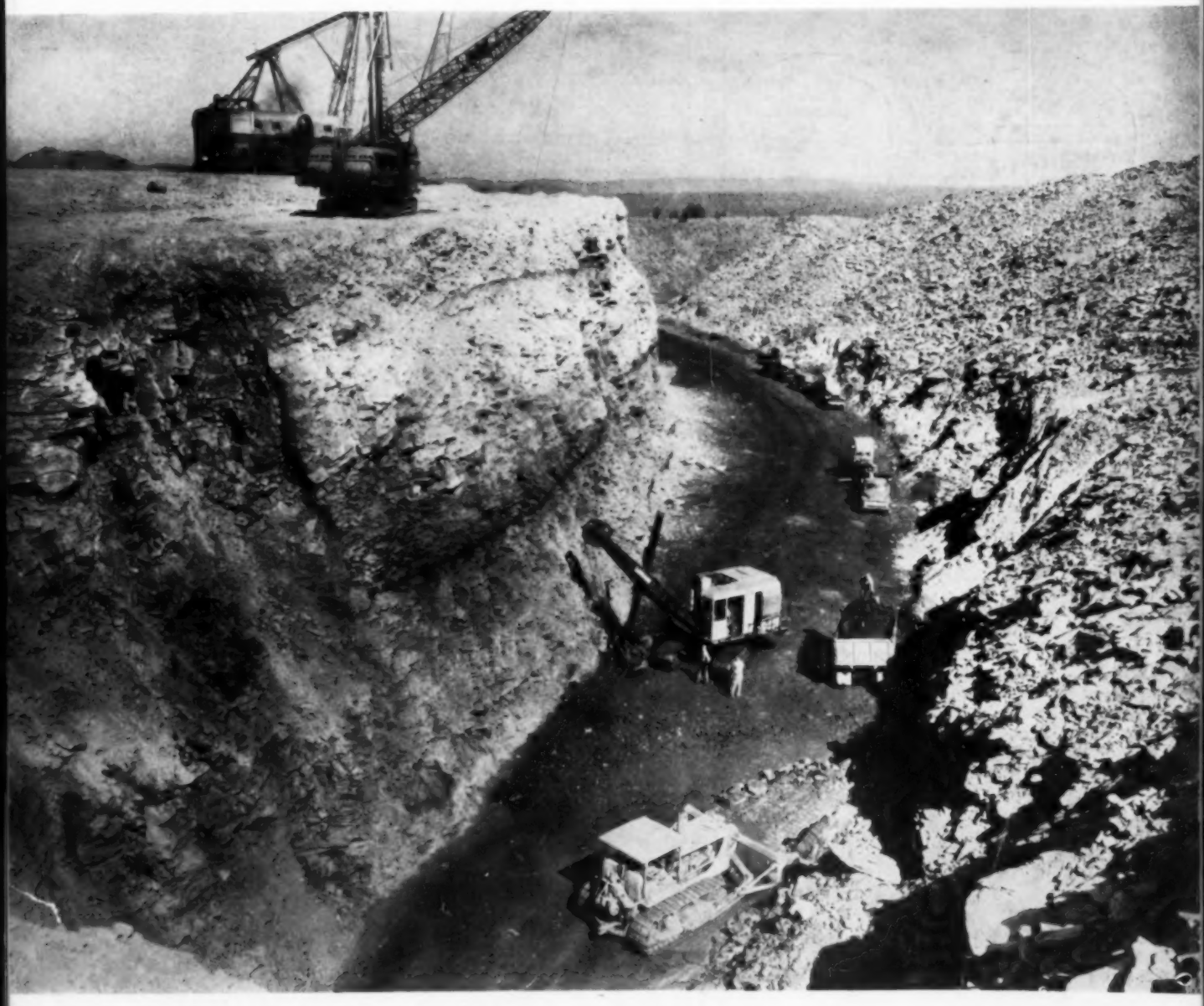
Economy Portal

New portal at Consol (Ky.) Mine No. 214, designed for low cost and efficiency, cuts travel time 30 min. p 62

Expanding Stripping

How a larger unit for deeper cover needs washing facilities to handle coal from concentrated workings. p 56

Full Contents . . . p 5



Boosting Mining Efficiency . . . p 50

edison self-service

FOR

FAST, ECONOMICAL LAMPROOM OPERATION

The miner serves himself! In seconds he has his lamp off the rack, on his belt, and is ready for his shift. And the same holds true when the shift is over. Add it up . . . Edison Self-Service pays off in maximum lamproom economy.

We will be happy to show you how Edison Self-Service can bring economy and efficiency to your lamproom. Write or call for details.

Edison Double Filament Bulb means continued, full light

See that double filament in the bulb? It's your proved protection against lost time for the miner, and a short crew for the foreman. If one filament burns out, a turn of the switch restores continued, brilliant, full illumination—*working light*, not just emergency light!

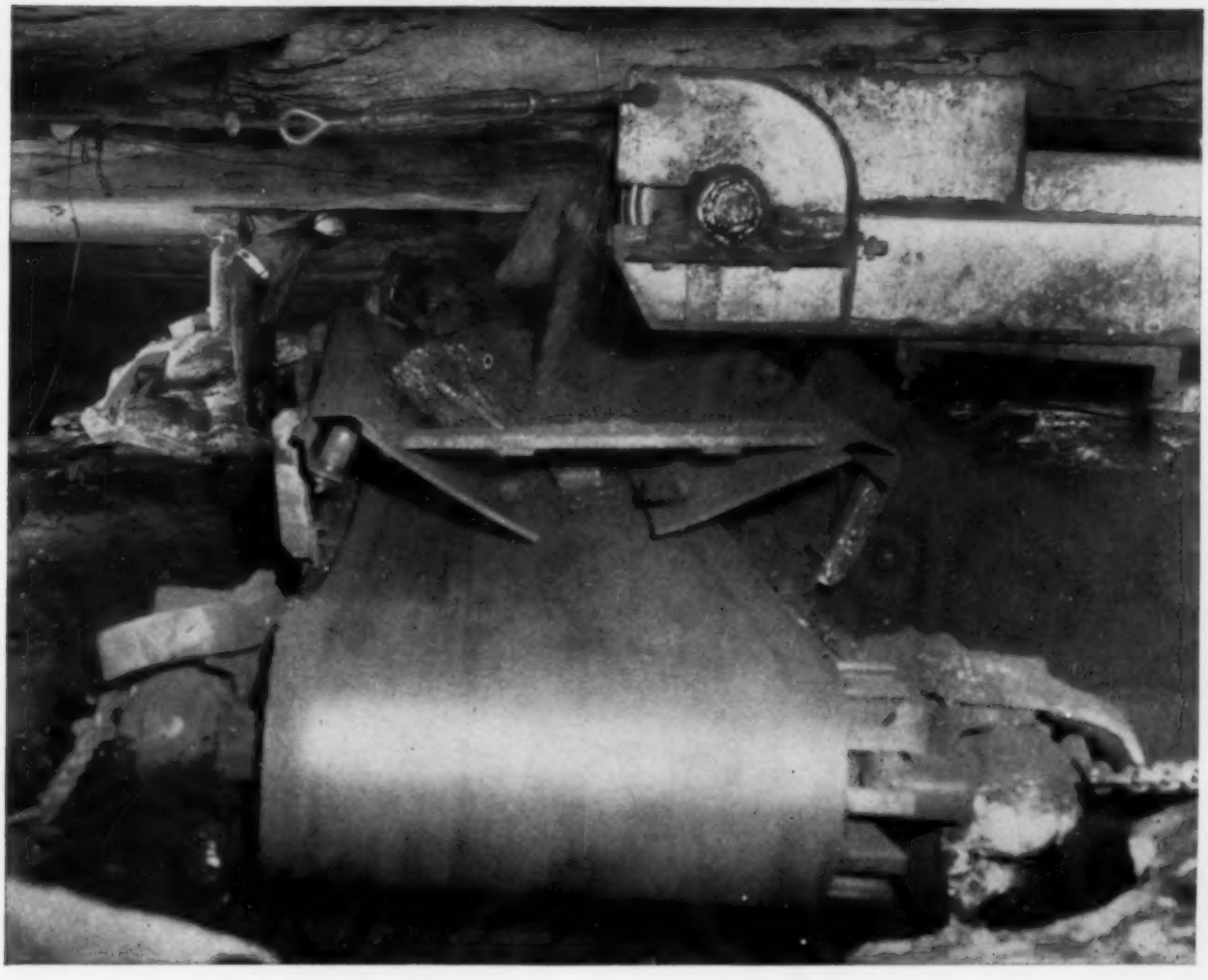
M-S-A
SAFETY EQUIPMENT HEADQUARTERS

When you have a safety problem, M.S.A. is at your service . . . our job is to help you!

MINE SAFETY APPLIANCES COMPANY
201 North Braddock Avenue, Pittsburgh 8, Pa.
At Your Service: 77 Branch Offices in the United States and Mexico

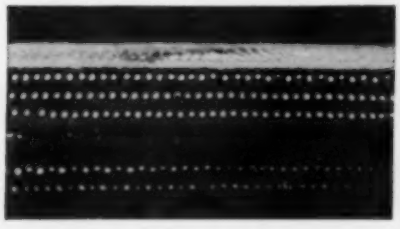
MINE SAFETY APPLIANCES CO. OF CANADA, LTD.
Toronto, Montreal, Calgary, Edmonton, Winnipeg, Vancouver, Sydney, N.S.

RESEARCH KEEPS **B.F.Goodrich** FIRST IN RUBBER



Mildew-resisting cord belt lasts 2½ times longer in "wet" mine

THAT belt has just run through water on its return from hauling chunks of coal to the mine railway. Wet operations like this cause mildew which quickly spreads across ordinary belts weakening them to the breaking point. There are two reasons why this can't happen to a B. F. Goodrich cord belt.



In this B. F. Goodrich belt there are plies of parallel cords, running lengthwise, built into both the top and bottom of the belt. Each cord is completely surrounded by rubber—no cross threads tie them together (see cross section). A cut in belt admits moisture or damaging acid to only those few cords exposed. There are no cross cords to wick moisture across belt width. No other conveyor belts are made like this.

As an added protection, B. F. Goodrich cord belts are treated with mildew inhibitors. These chemicals act directly on fungus spores, effectively protect belts against mildew.

That's why the B. F. Goodrich belt in the picture was chosen by the mine operators. And it has paid off. The belt has carried 3½ million tons over an 11 year period. Other belts on this same job lasted only 4 years.

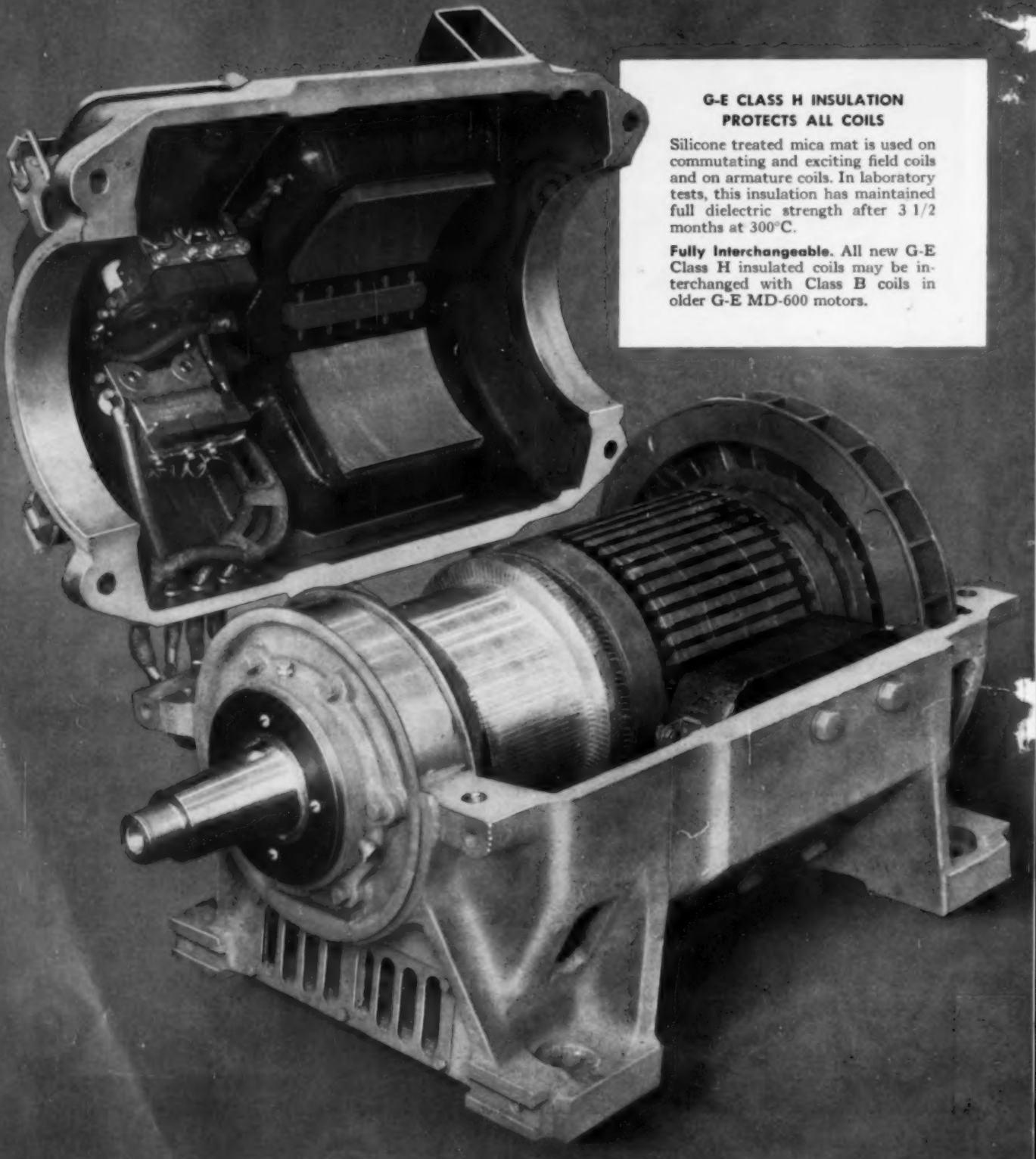
If exposure to moisture and mine acids is shortening the life of your coal-handling belts, you need a B. F. Goodrich *cord* belt. Let your BFG distributor show you how these longer-lasting conveyor belts can save you money. *The B. F. Goodrich Company, Dept. M-513, Akron 18, Ohio.*

B.F.Goodrich
INDUSTRIAL PRODUCTS DIVISION

PROGRESS IN
DIRECT-CURRENT DRIVES

NOW! Roastouts

NEW G-E MD-600 MOTORS



G-E CLASS H INSULATION PROTECTS ALL COILS

Silicone treated mica mat is used on commutating and exciting field coils and on armature coils. In laboratory tests, this insulation has maintained full dielectric strength after 3 1/2 months at 300°C.

Fully Interchangeable. All new G-E Class H insulated coils may be interchanged with Class B coils in older G-E MD-600 motors.

Virtually Eliminated on . . .

WITH CLASS H INSULATION

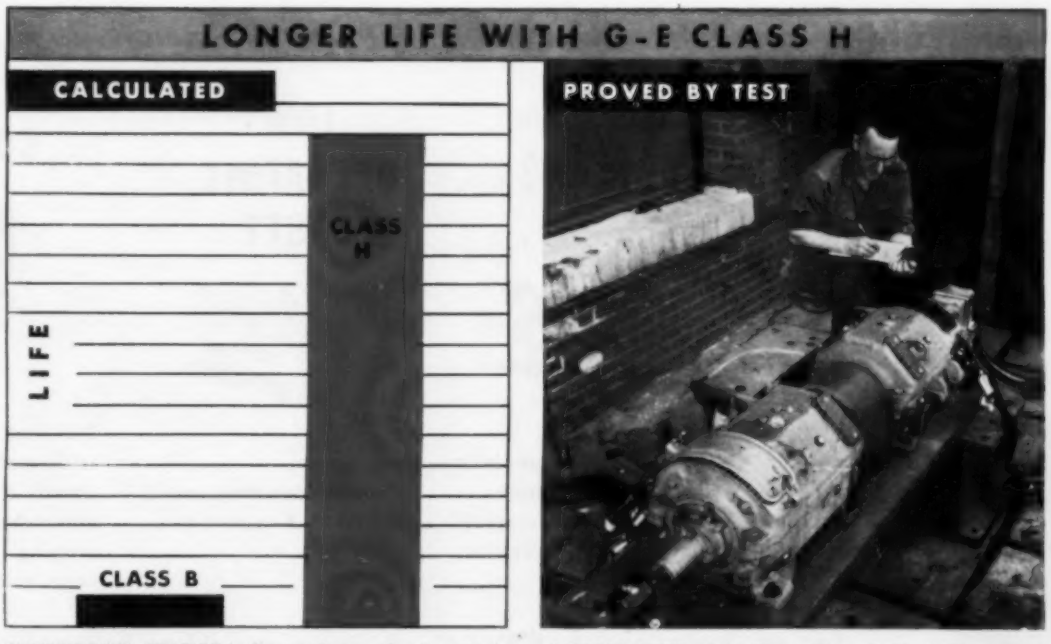
G.E. offers—in all MD-600's—Class H Insulated Coils

WHAT IS CLASS H? General Electric research has developed a combination of inorganic and silicone materials for a new insulation system now used in all MD-600 motors. These Class H materials will withstand temperatures up to 180°C continuously.

BETTER FOR HEAVY DUTY. Auxiliary mill motors often encounter unexpected high ambient temperatures, unforeseen extended duty or emergency conditions. Any one of these can cause "roastouts" from temperatures higher than the insulation capacity. The new G-E Class H insulation will resist up to 50°C more than Class B, resulting in longer motor service.

REWINDS ELIMINATED? On normal duty, insulation failure may be eliminated as the limiting factor in continuous armored motor service. Engineers calculate that each 10°C rise in temperature reduces the life of a given type of insulation by half. *Since G-E Class H will withstand 50°C higher than Class B, its life* **at the same temperature** *should be increased 2^5 or 32 times!*

YOUR G-E SALES REPRESENTATIVE HAS COMPLETE INFORMATION. Contact him at your nearby G-E Apparatus Sales Office, or write Section 812-1, Direct Current Motor and Generator Department, General Electric Company, Erie, Pennsylvania.



ENGINEERING STUDIES indicate that under identical operating conditions new G-E Class H insulated coils in MD-600 motors will last up to *32 times* as long as conventional Class B coils. Insulation failure may be eliminated as the limiting factor in continuous auxiliary mill motor service.

ACTUAL TEST with Class H and Class B motors coupled together *proves to date* the new insulation will last more than twice as long as the old. After burning out two Class B insulated motors, the one with Class H coils is still operating under exaggerated load, vibration and atmospheric conditions.

Progress Is Our Most Important Product

GENERAL ELECTRIC

Why choose a BIRD filter to dry your fine coal?

THOROUGH MOISTURE REMOVAL?

yes

The Bird delivers coal as dry as can be obtained by any mechanical means.

BIG CAPACITY?

yes

The Bird will handle a ton or more a minute . . . and it does the complete job, without auxiliary equipment.

LOW OPERATING COST?

yes

Overall operating cost is as low as 5 cents a ton.

LOW MAINTENANCE COST?

yes

The Bird runs non-stop, with maintenance shutdowns months apart and maintenance costs averaging less than two cents a ton.

Let us show you what Bird Coal Filters can do to improve output and overall economy in your preparation plant.

BIRD MACHINE COMPANY
SOUTH WALPOLE • MASSACHUSETTS
REGIONAL OFFICES: EVANSTON, ILLINOIS • PORTLAND, OREGON

Coal Age

DECEMBER • 1955

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Coming in Coal Age

Wet Rockdusting

In-cycle wet rockdusting in continuous-mining systems is the latest achievement of a large producer. How the work is done, what equipment is needed and what results have been obtained will be brought out in an article that will provide profitable reading for you. Look for it in the January issue.

25-Ton Cars Underground

Hendrix mine, Consolidation Coal Co. (Ky.) changes from surface to underground haulage, featuring automatic loading of 25-ton cars at belt heads. One man handles entire main-haulage system including dumping. Be sure to see this full description of a worthwhile new development.

Pay-Off Forestry For Coal Operators

Integrated systems of planting, cutting and milling can fill needs for coal mine materials, turn a profit in high-grade lumber and ensure sustained yield of forest products. These are conclusions drawn from co-operative studies of coal-land tree farms by Island Creek Coal Co. and University of West Virginia.

Circus Train

Midland Electric Coal Co. shipped a 5-yd dragline 800 mi by rail. The story of how they disassembled and loaded the machine is one you can place in your files against the day when you may face a similar problem.

Also in an early Issue . . .

Throwing a strong beam through a haze of atomic stardust, a coming feature by Bill Raleigh, of the Coal Age editorial staff, presents up-to-date estimates of the extent of the atom's participation in the electric-energy market and suggests a plan of act'on for coal in meeting its own obligations as a basic source of energy.

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Harold Davis, Associate Editor — A. E. Flowers, Associate Editor — W. A. Raleigh Jr., Assistant Editor

Christopher Elias, Assistant Editor — F. A. Zimmerli, Assistant Editor (layout) — G. B. Bryant, Jr., Washington

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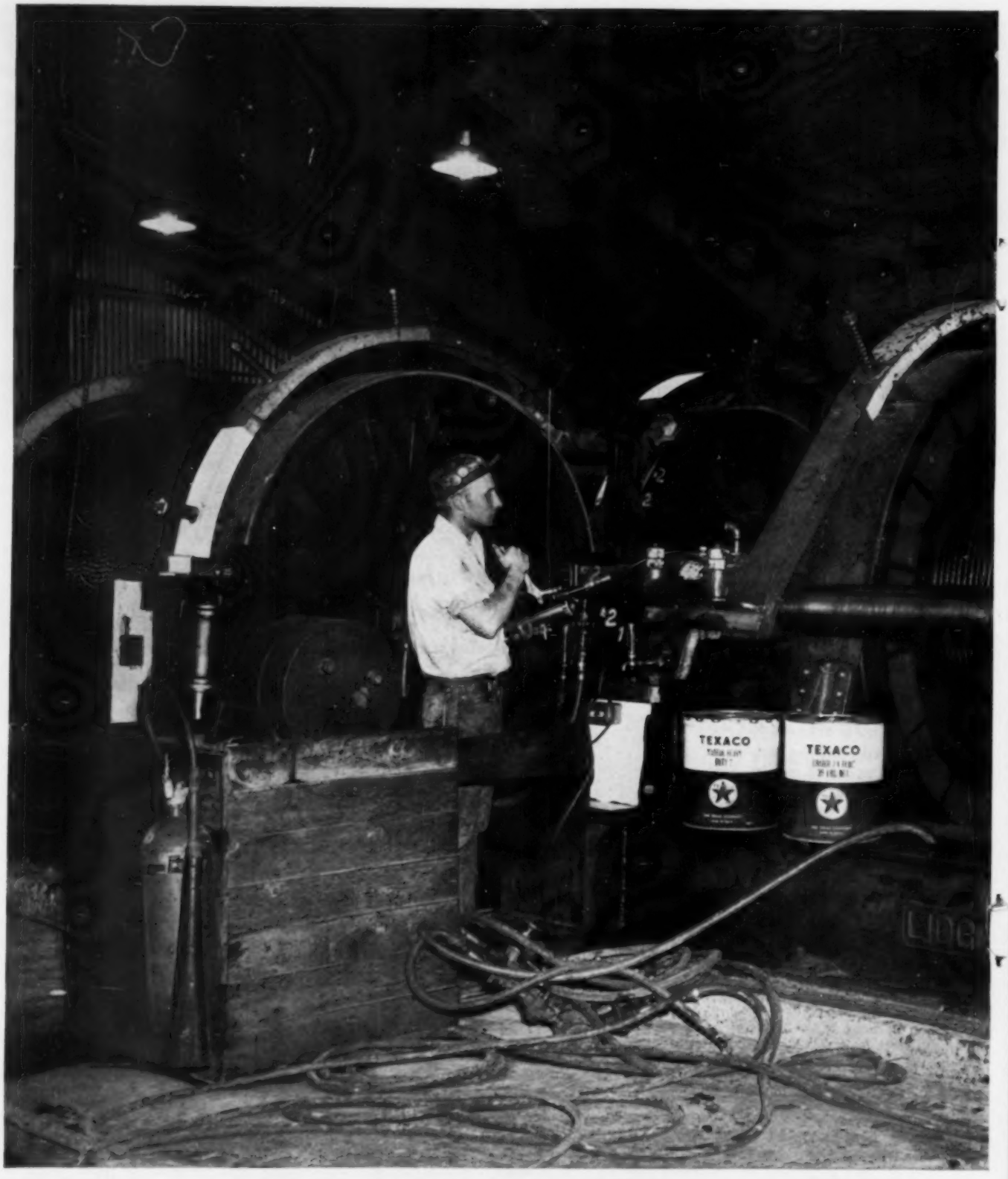

TUNE IN:
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METROPOLITAN OPERA
radio broadcasts
Saturday afternoons.

TEXACO

TEXACO

Get longer life from hoist cables

High on the list of good maintenance practices for wire rope stands effective lubrication. Use *Texaco Crater.* It quickly *gets between* the strands and assures long-lasting protection against wear and rust. *Texaco Crater* also surrounds and protects the core. Thus, you can count on keeping rope strong longer, reducing maintenance costs.

On open gears, *Texaco Crater* coats the teeth with a clinging, persistent film that reduces wear, cushions shocks and muffles noise. It will not channel, ball up or throw off.

In cold weather, many operators prefer *Texaco Crater X Fluid* for these jobs. It has the advantage of *going* on as a liquid—but *stays* on just like the regular *Crater.*

For mine car wheels of all types, use *Texaco Olympian Grease.* It assures easier starts in winter weather and gives long-lasting protection, reduces maintenance costs.

A Texaco Lubrication Engineer will gladly help you simplify and improve the lubrication of all your equipment. Just call the nearest of the more than 2,000 Texaco Distributing Plants in the 48 States, or write:

The Texas Company, 135 East 42nd Street, New York 17, N. Y.

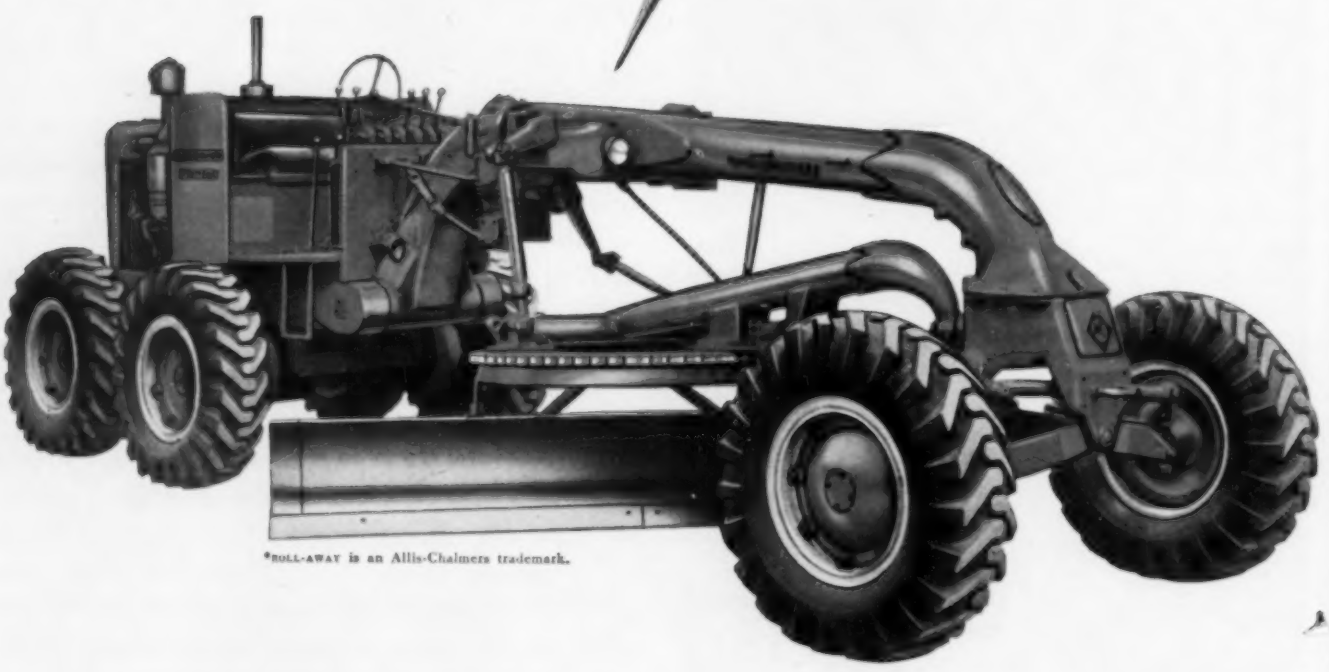
LUBRICANTS for the Coal Mining Industry

NEW BIG SCALE PERFORMANCE

NEW OPERATING EASE AND COMFORT

ALLIS-CHALMERS

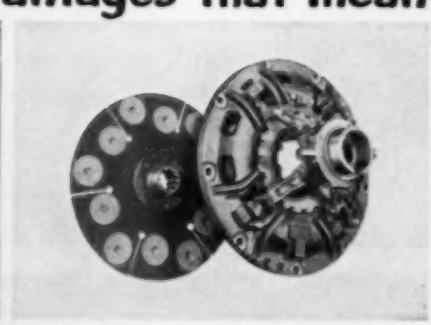
BIG NEW



*ROLL-AWAY is an Allis-Chalmers trademark.

Major advantages that mean more production . . .

Powerful new Allis-Chalmers diesel featuring exclusive "follow-through" combustion for smooth performance, clean combustion, extra-long life.



Exclusive new ceramic clutch lining sets new standards of long clutch life, keeps clutch operating longer between adjustments, reduces lever pull.

All-new toggle-type controls give a *Forty Five* operator precision control with positive "feel" — in addition to easy finger-tip action regardless of load.

Forty Five MOTOR GRADER

120 HORSEPOWER • 23,800 POUNDS

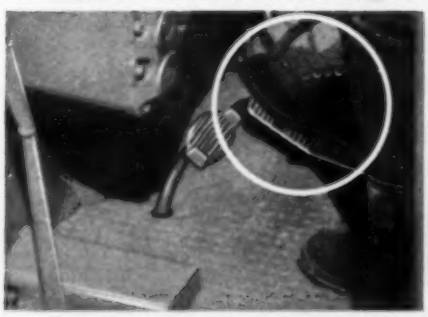
The *Forty Five* is a truly modern heavy-duty motor grader . . . designed for progress and built to *today's* standards of accuracy, dependability, operating ease and low cost. On road construction or maintenance work, you'll see all the advantages of balanced power, weight, traction and proper speeds . . . plus brand new advantages for the operator and mechanic that no other heavy-duty grader offers.

We invite you to check the features shown here. Then for the full story on the *Forty Five* — including extra-big clearances, exclusive ROLL-AWAY* moldboard, single-member tubular frame and fully enclosed power steering —see your nearby Allis-Chalmers dealer.

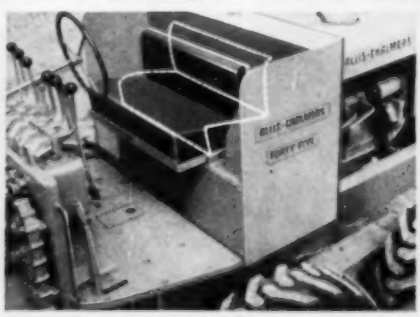
CONSTRUCTION MACHINERY DIVISION, MILWAUKEE 1, WISCONSIN

ALLIS-CHALMERS

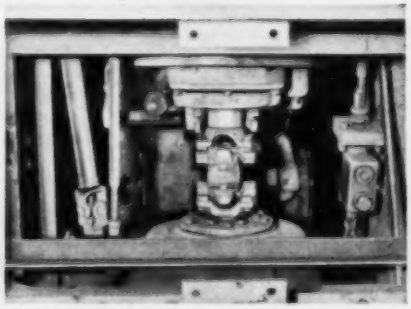
. . . less maintenance . . . easier and better operation!



New accelerator-decelerator pedal lets the operator increase or decrease engine speed with his foot — without changing his hand throttle setting.



"Box seat" comfort and visibility. Foam-rubber seat adjusts for sit-down or stand-up operation. Flat, roomy platform has tapered corners for top blade visibility.



Matchless servicing accessibility. Unit construction permits easy service or removal of clutch, transmission or engine without disturbing adjacent parts.

IN HIGH ROOF AREAS, such as main haulage ways, where a permanent anchor is required, Republic's Forged Wedge Head Bolt Assembly is ideal. It is also particularly suited for use in tunnels, hillside cuts, foundations and other permanent installations. This is the strongest roof bolt assembly made. Installation is easy. The hole need not be drilled to a predetermined depth. It need only be longer than the bolt.

FOR YOUR HIGH OR

WEDGE HEAD FEATURES—The wedge is forged as an integral part of the bolt. Deep, sharp serrations provide positive holding power. Steep angle of wedge assures positive anchor. Rubber washer on wedge insures an immediate anchor in oversize holes.

BOLT SHANK FEATURES—The bolt is not twisted in tightening operation. This eliminates the danger of setting up internal torsional stresses and the possibility of twisting the bolt in two. Bolt has a full four inches of rolled threads. Exposed threads below bearing plate provide a fastening point for other equipment. Available in ¾″ diameter low- or high-carbon steel to any specified length.

Republic Mine Roof Bolts

These bolts have been thoroughly tested in Republic's own mines, in all types of strata and have been proved safe and dependable for bolting in any type of roof at any height.

Republic Roof Bolts are backed by more than 100 years of skill and experience in the manufacture of all types of fasteners. And, because Republic uses its own ore, makes its own steel, controls quality at every stage of production, you are assured of roof bolts of the highest quality and dependability.

HIGH STRENGTH, TOUGHNESS, CORROSION-RESISTANCE—three features of Republic High Strength Steels—mean longer life for mine cars, particularly in heavy, abusive service. And when these cars or other mobile equipment are designed and engineered to take full advantage of Republic High-Strength Steels, weight savings up to 50% are possible. Republic offers two booklets on high-strength steels. Send the coupon for your copies.

UNDERGROUND OR ON THE SURFACE, Republic Flexible Plastic Pipe licks corrosive mine waters. Chemically inert, immune to electrolytic action, it stubbornly resists acids, alkalies, metallic salts and other corrosive wastes. Republic Flexible is easy to handle, easy to join. Only tools needed are screwdriver, knife or handsaw. Available coiled from your Republic Distributor in diameters ½″ through 3″—in straight lengths in 4″ and 6″ diameters.

IN LOW ROOF AREAS, where every inch of clearance counts, Republic's Square Head Roof Bolt with the Wedge Nut and Shell Assembly is recommended. This type provides maximum head room for continuous mining machines and their operators. Protruding threads below the bearing plate, so often a hazard in ceiling areas less than five feet high, have been eliminated. Bolts and bearing plates are recoverable.

LOW ROOF AREAS

Provide Safe, Efficient Bolting

Whatever your roof bolting problem, Republic's Bolt and Nut Division has the answer in the largest combination of roof bolt, roof plate and expansion shell assemblies available to the mining industry.

For complete details on the Mine Roof Bolt Assemblies illustrated on these pages, mail the coupon for Mine Roof Bolt Booklet #569. It also contains information on materials, packaging, installation, other assemblies, how to order.

WEDGE NUT AND SHELL ASSEMBLY FEATURES—Provide the strongest anchor of all expansion-type shells. Greater total expansion is obtained. More shell area is in contact with the hole wall. Rubber washer around wedge nut gives strong initial grip and eliminates shell turning in hole.

SQUARE HEAD BOLT FEATURES—Installed rapidly with either stoper or auger. Head and washer forged as one piece. Head is unchamfered for snug wrenching. Furnished in ⅝″ dia. in high- or low-carbon steel with American Standard Regular or Heavy Head. Also in ¾″ dia., high- or low-carbon steel with American Standard Regular Head. Bolt length in inches is marked on bolt head. High-carbon steel bolts marked R-40 on head.

REPUBLIC STEEL

World's Widest Range

of Standard Steels and Steel Products

REPUBLIC STEEL CORPORATION
3124 East 45th Street
Cleveland 27, Ohio

☐ Please send Booklet #569 on Republic Mine Roof Bolts

I am also interested in more information on:

☐ High-Strength Steels ☐ Plastic Pipe

Name_____ Title_____

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K-10048

Amoco lubricants keep your mine machinery running smoothly all winter long!

The tipple and cleaning plant of Robey Run Coal Company, Dela, West Virginia, is another modern and highly complicated operation depending on Amoco Mine Lubricants for proper protection, even in the coldest weather.

With the correct grade of Amoco Mine Lubricant specified by Amoco Mine Lubrication Engineers, expensive installations like Robey Run's are being protected throughout AMOCOal land.

AMOCO®

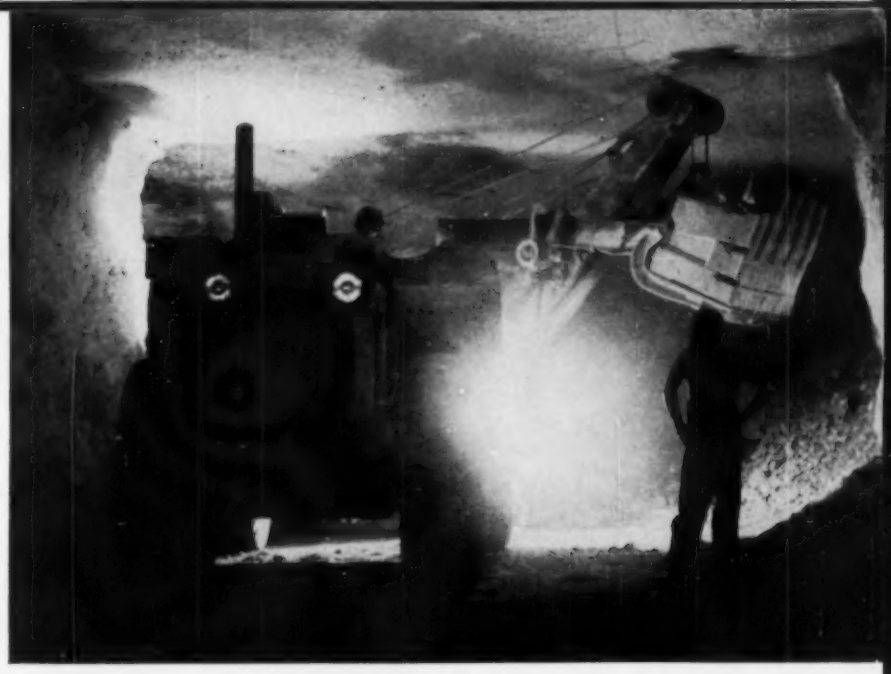
AMOCO LUBRICANTS

. . . SURE • SAFE FOR MINE MACHINERY

AMERICAN OIL COMPANY • NEW YORK

2300 ft. underground

7 Rear-Dumps haul million tons of limestone yearly



Imagine yourself with the problem that faced a large Eastern U.S.A. chemical company a few years ago.

Your plant needs thousands of tons of limestone daily for manufacture into agricultural lime and cement, and for chemical processing into chlorine, soda ash, and other products. Much of your stone has to be shipped in. Transportation prices are boosting your costs.

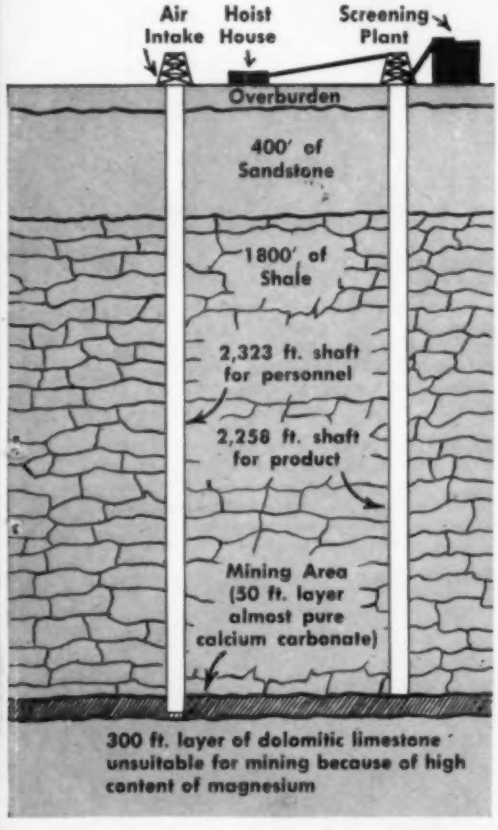

Air Intake
Hoist House
Screening Plant
Overburden
400′ of Sandstone
1800′ of Shale
2,323 ft. shaft for personnel
2,258 ft. shaft for product
Mining Area (50 ft. layer almost pure calcium carbonate)
300 ft. layer of dolomitic limestone unsuitable for mining because of high content of magnesium

Diagram shows the two 8′ x 17′ shafts. One carries men and equipment, the other brings crushed limestone to the surface. Shafts also carry in 100,000 cubic feet of fresh pumped air every minute. They also take out blasting and diesel fumes. The natural mine air is dry. No water drips from ceilings or seeps through walls. Temperature stays 80° year-round. Cave-in dangers are absent; strength of the limestone sidewalls, plus arching effect of 2,000 ft. of rock above, eliminates need for shoring or other artificial bracing.

With these difficulties, you would undoubtedly do what this company did — look for a nearby source. And, you would probably never guess where you would find it. About 2,300′ below your own property, under clay, shale, and sandstone, your drills would run into a 50′ layer of almost pure limestone, satisfactory material for all your needs. But how could you get to it?

Sink two 2300′ shafts

This company answered that question by borrowing some ideas from underground ore and coal miners. First, they drove two 8′ x 17′ steel-and-concrete-lined shafts vertically to the limestone bed. Then, they developed a network of underground roads (now totaling 19.9 miles) to a centrally-located crusher. Next they equipped the mine with 4 electric shovels, 9 drilling rigs, a tractor, 4 loaders, 4 trucks, and a bus to move 80 workers to their assignments.

For hauling, they chose 7 LeTourneau-Westinghouse Rear-Dumps, 16-ton models with bodies built up to hold 20 tons. These units, company officials figured, would be ideal for underground use, because they could turn non-stop anywhere on the narrow 32′ roadways — and their simple rugged construction would reduce repair work.

Assemble machines on mine floor

Then came another problem: how to get these big Rear-Dumps into the mine, nearly ½ mile below? LeTourneau-Westinghouse engineers helped out here. The rigs were shipped to the plant tack-welded. Wheels and prime-movers were separated and lowered down the shaft. Truck bodies, too, were cut apart and lowered. Re-welds and re-assembly were made on the mine floor, and work was started.

With the 1½-yd. shovels loading well-blasted limestone, each Rear-Dump gets 20-ton heaped load in about 2 minutes. Haul of 3,000′ one way over the level underground roads is made in 2nd and 3rd gear (7 and 13 mph); return in 3rd. The 7 Rear-Dumps average 3,600 tons of limestone per 16-hour day, over a million tons per year. Short turns with power steer have proved a major advantage in positioning at shovel, backing to dump into hopper, and maneuvering in all tight spots.

Another advantage these Rear-Dumps have given is safety. *Each* of the 4 wheels has more braking surface than *all 4* wheels on most haulers. Operators travel confidently at high speeds.

A third advantage . . . there has been practically no downtime for tire troubles on the Rear-Dumps' big single pneumatics. In 4 years of single and double-shifting the 7 units, only one blowout has occurred. Sets of tires have lasted as long as 7,000 hours without recapping, despite the rough pit floor and heavy 20-ton loads. Plant records show over-all mechanical efficiency for all the Rear-Dumps of 96%.

You, too, can solve your hauling problems with LeTourneau-Westinghouse Rear-Dumps. There is a size to fit your needs, 11, 22, and 35 tons.

LeTourneau-WESTINGHOUSE Company
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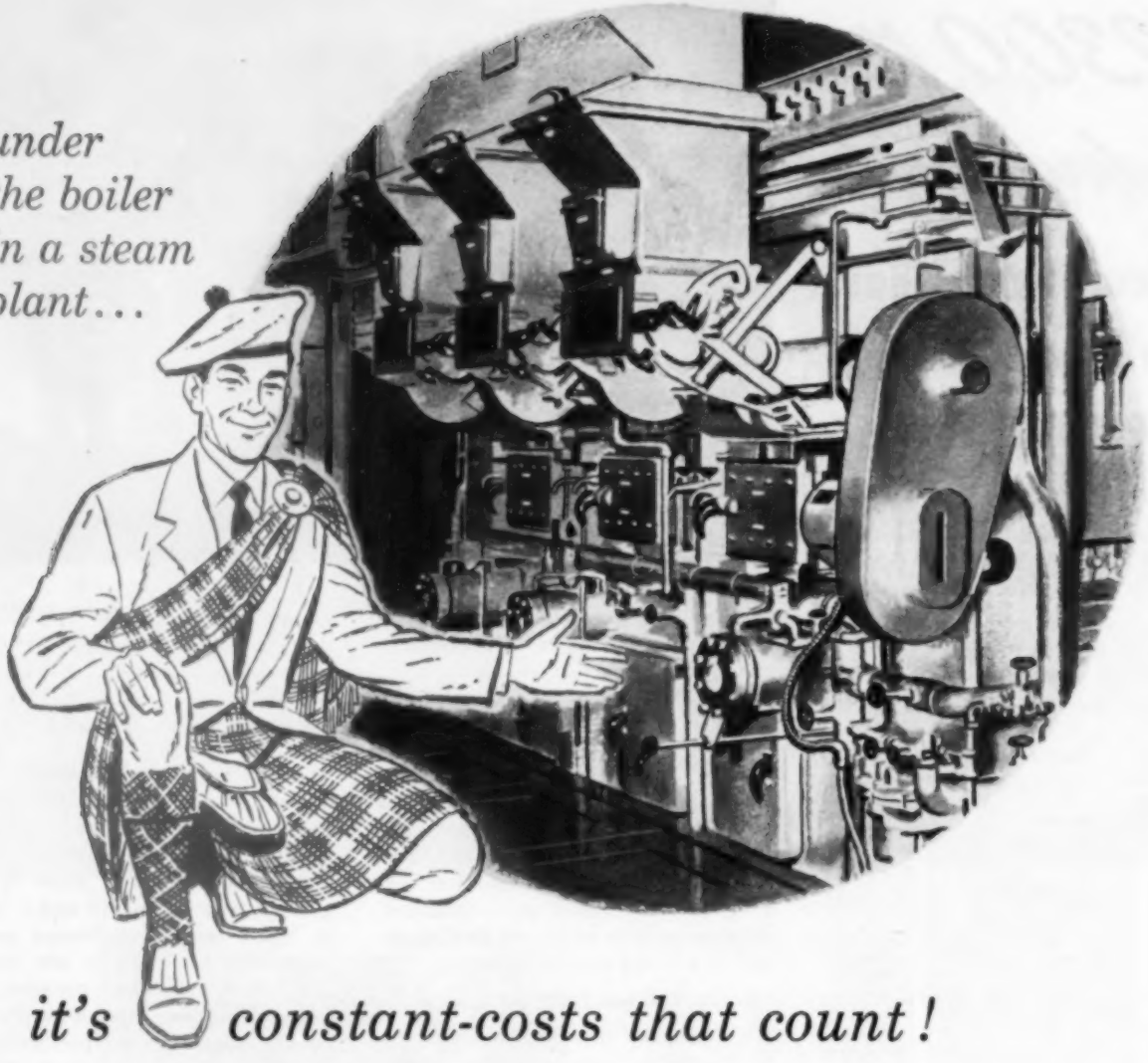
R-464-G-bw

under the boiler in a steam plant...



it's constant-costs that count!

Be Thrifty! Expensive boiler installations designed to burn fuels with limited futures is doubtful wisdom. The sensible alternative is to *bank on Bituminous!* Plotting your costs over the long run will prove efficiency and lowest cost in most cases. For, Bituminous reserves are unlimited—they're nearest to most manufacturers—coal technology improves burning equipment, efficiency and cost year by year.

Let our Coal Technical Service plot a constant-low-cost Bituminous coal for your needs. *Ask our man!*

COAL TRAFFIC DEPARTMENT, BALTIMORE & OHIO RAILROAD

Baltimore 1, Maryland—Phone: LExington 9-0400

LINKING 13 GREAT STATES WITH THE NATION B&O

BALTIMORE & OHIO RAILROAD

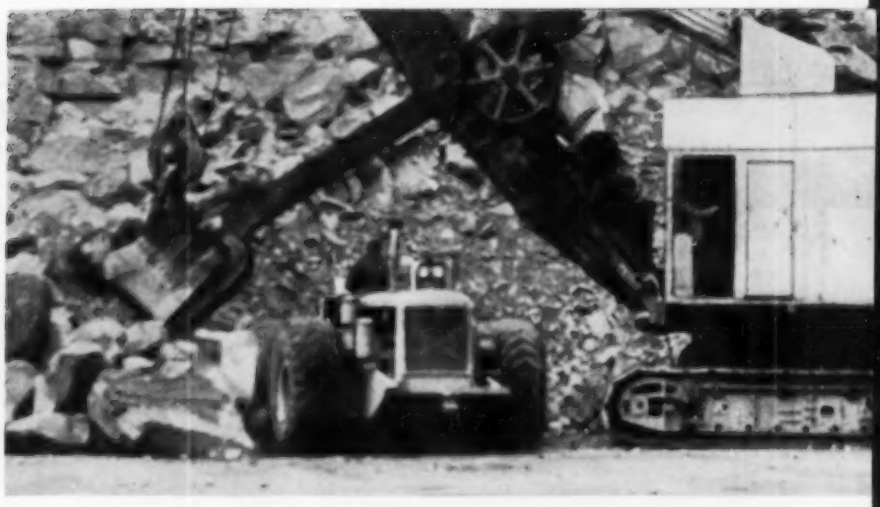
BITUMINOUS COALS FOR EVERY PURPOSE

3 shovels,

10 trucks,

23 stone stockpiles,

2 waste dumps...



1 tractor handles all cleanup

Too big for shovel to handle, these limestone chunks are dozed into worked-out sections of the pit. Four-wheel drive, 208 hp give tractor plenty of power to push up to 2½ cubic yards (5½ tons) per pass.

Tournatractor can switch up to 10 rail cars at once. Low-pressure tires do no damage to rails, ties, or paved surfaces. Supt. J. M. Christopher reports this unit requires "much less lubrication and considerably less maintenance than crawler-tractors formerly used."

For 100 years, the East St. Louis Stone Company and its predecessors have been quarrying limestone from a pit near Belleville, Illinois. For 100 years, they have dug in different directions, until, today, load areas are far apart and on levels varying from near-surface to over 225 ft. below surface. Three shovels and ten 11-ton trucks are now used to remove about 750,000 tons of stone yearly.

Suppose you were running this big job. Suppose you had to contend with its widely-scattered loading sites, its network of haul roads, and its steep grades. How many tractors would you ask for to do the "housekeeping" chores? How many to handle shovel cleanup? How many for haul road maintenance? Dump cleanup? Stockpiling? Emergency work?

East St. Louis Stone Company's Superintendent, J. M. Christopher, has what you'll probably agree is the most efficient answer possible. He is using *one tractor to do it all!* His choice is a high-speed rubber-tired Tournatractor.

Travels 1670 feet in 1 minute

This mobile unit "runs" from job to job at speeds to 19 mph. It dozes at speeds up to 8 mph. "We sure like its ability to go fast from one place to another," says Mr. Christopher. Its regular assignments, scattered 0.1 to 1.5 miles apart, include:

1. Cleans pit floor around all 3 shovels (1½, 2 and 2½ yds. in size). Works at each shovel two or three times per 8-hour shift. Besides ordinary cleanup, dozes over bank any rock chunks too big for shovel to handle. Typical 150 ft. to 200 ft. one-way push takes one minute . . . backup same distance takes half a minute.
2. Cleans shot stone after blasting at each of the 3 locations.
3. Moves large Joy drill around pit.
4. Levels and cleans around crushed stone stockpiles once or twice a day.
5. Levels waste dump once a day. Material mostly clay mixed with limestone. Tournatractor dozes up to 2½ cubic yards per pass.
6. Blades haul roads for the 10 trucks about once a day.
7. In emergencies, switches railroad cars. Can push 3 full cars (total weight, approximately 240 tons) or 10 empties.

Let us demonstrate

If speed on similar jobs is important to *you,* let us show you the fastest tractor on the market today . . . the 19 mph Tournatractor. We'll be glad to demonstrate on your job, doing the work you're interested in. Call us to arrange time and place.

Tournatractor—Trademark Reg. U.S. Pat. Off. T-787-Q-b

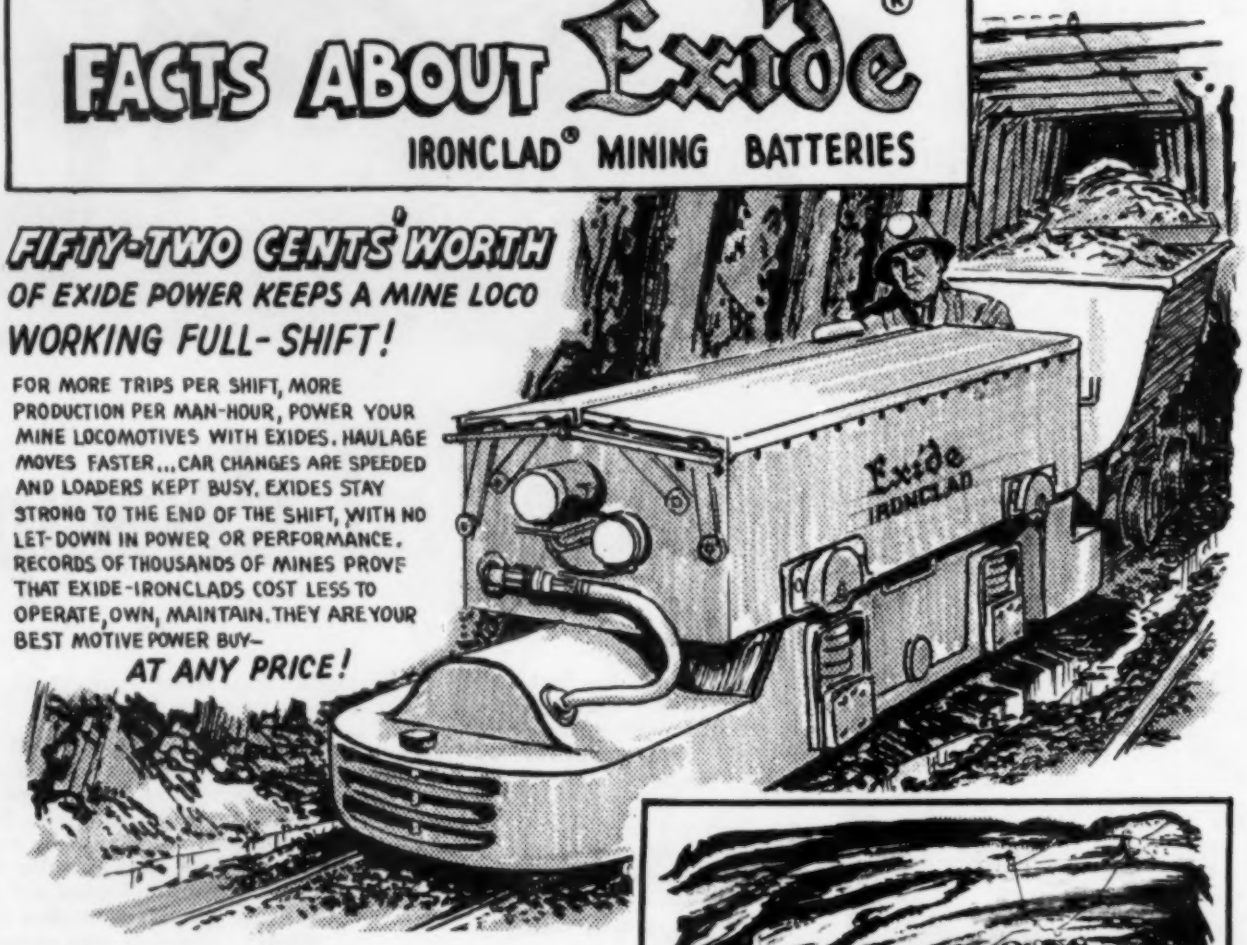
LeTourneau-WESTINGHOUSE Company

Peoria, Illinois

A Subsidiary of Westinghouse Air Brake Company

FACTS ABOUT Exide®

IRONCLAD® MINING BATTERIES

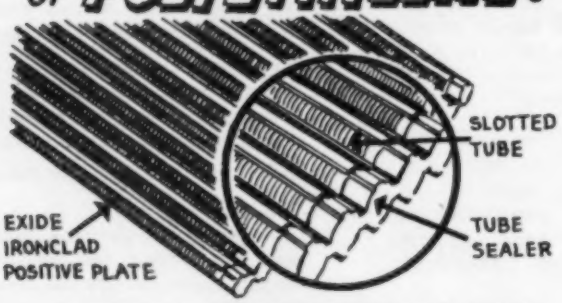


FIFTY-TWO CENTS' WORTH OF EXIDE POWER KEEPS A MINE LOCO WORKING FULL-SHIFT!

FOR MORE TRIPS PER SHIFT, MORE PRODUCTION PER MAN-HOUR, POWER YOUR MINE LOCOMOTIVES WITH EXIDES. HAULAGE MOVES FASTER... CAR CHANGES ARE SPEEDED AND LOADERS KEPT BUSY. EXIDES STAY STRONG TO THE END OF THE SHIFT, WITH NO LET-DOWN IN POWER OR PERFORMANCE. RECORDS OF THOUSANDS OF MINES PROVE THAT EXIDE-IRONCLADS COST LESS TO OPERATE, OWN, MAINTAIN. THEY ARE YOUR BEST MOTIVE POWER BUY—

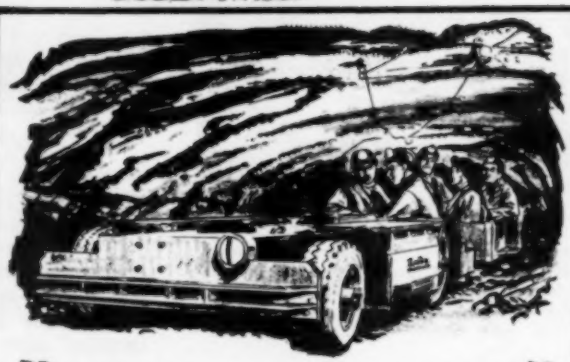
AT ANY PRICE!

MAGIC POWER TUBES OF POLYETHYLENE!



NOW, ACID-PROOF, NON-CORRODING POLYETHYLENE PLASTIC TUBES AND SEALERS ARE INSIDE ALL EXIDE-IRONCLADS! DEVELOPED IN THE LABORATORY, TESTED IN THE FIELD, AND ALREADY PROVED IN CUSTOMER USE—THIS MIRACLE BATTERY MATERIAL IS THE LATEST IMPROVEMENT IN EXIDE-IRONCLADS. ITS USE GIVES YOU MORE POWER IN THE SAME SPACE! LONGER BATTERY LIFE! BETTER PERFORMANCE! LESS MAINTENANCE!

FOR THE AMAZING "INSIDE STORY" ON NEW EXIDE-IRONCLADS WITH POLYETHYLENE, CALL YOUR EXIDE SALES ENGINEER!



"UNDERGROUND TAXI"

CUTS COSTS, BOOSTS PRODUCTION WITH EXIDE-IRONCLAD POWER!

THIS EXIDE-POWERED TRACTOR-TRAILER SPEEDS WORK CREWS, SUPPLIES AND EQUIPMENT TO PRODUCTION AREAS IN HALF THE TIME OF OTHER METHODS—WITH SAFETY, AND AT LOWEST COST. TO CUT PORTAL-TO-PORTAL TRAVEL TIME OR BOOST PRODUCTION, LET EXIDES HELP YOU. YOU'LL DO IT FASTER, BETTER, CHEAPER!

LET EXIDE HELP SOLVE YOUR MINING BATTERY PROBLEMS. ❶ CALL AN EXIDE SALES ENGINEER FOR FULL DETAILS. ❷ WRITE FOR FORM 1982, A MANUAL ON MAINTAINING MOTIVE POWER BATTERIES.

Exide INDUSTRIAL DIVISION, The Electric Storage Battery Company, Philadelphia 2, Pa.

Simplex Cables power and control longest, single-span vertical-lift bridge in the world!

Cape side of canal with bridge span down. Seven of nine cables visible are Simplex-ANHYDREX. Light-colored square beneath catwalk is 1100-ton concrete counterweight that rides inside the framework of each tower.

U. S. Army's 544-foot railroad span over Cape Cod Canal raised 130 feet with ANHYDREX

The 2200-ton span, located near Buzzards Bay in Massachusetts, carries the only railroad track between Cape Cod and the mainland.

Army and Air Force installations on the Cape depend upon this track for supplies. Therefore, both normal and emergency electrical circuits on the bridge must be as near perfect as possible.

The railroad company that maintains the bridge specified Anhydrex-insulated cables with neoprene jackets. Army engineers, who own and operate the bridge, approved this choice.

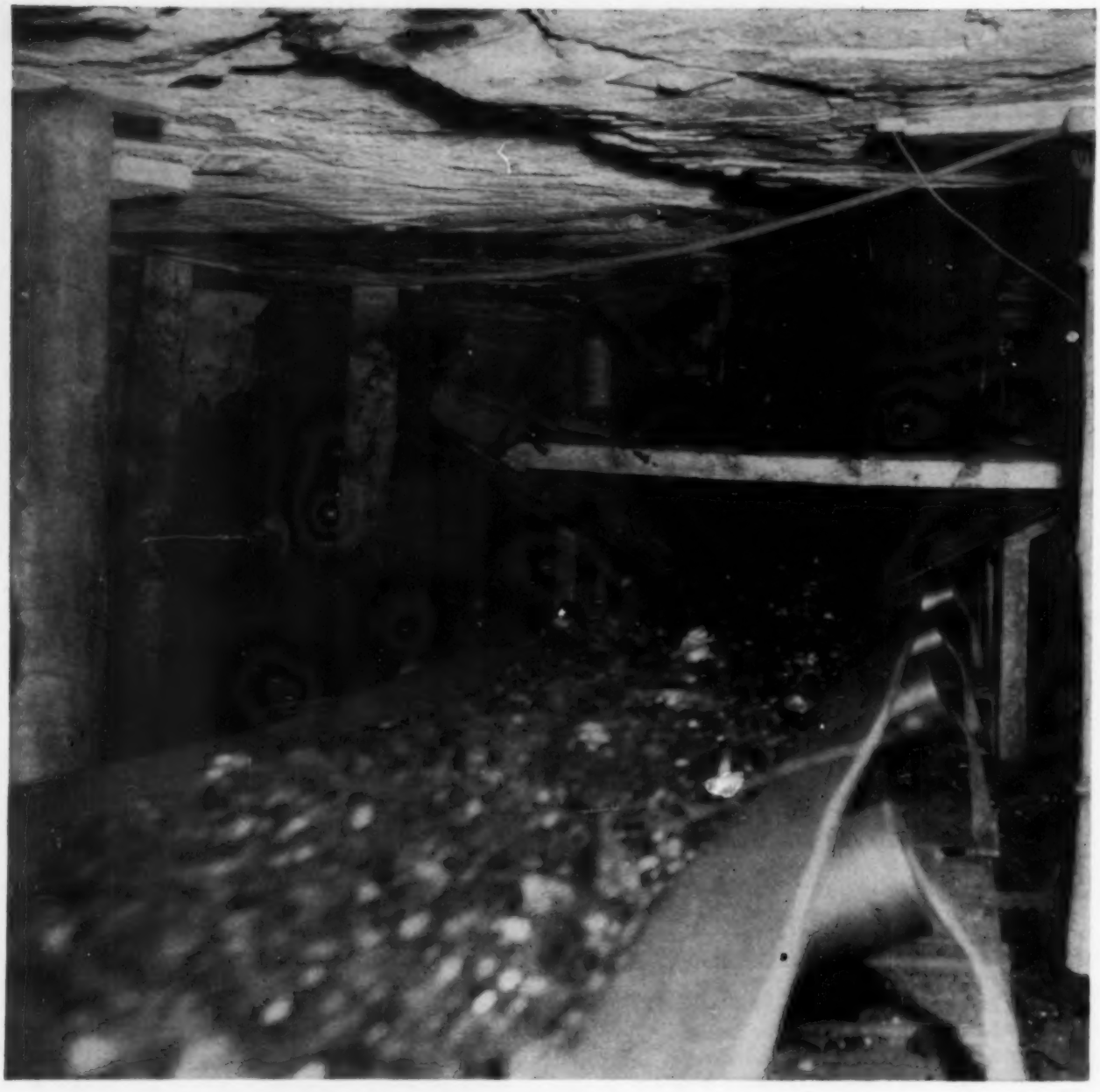
ANHYDREX Cables withstand effects of moisture, corrosion from salt air, sunlight and swaying in high winds.

Want the same service from power and control cables as the Army engineers? Ask your nearest Simplex representative about ANHYDREX Cables, or write to the address below.

Closeup of ANHYDREX Cables. Mainland on left. Span is raised and lowered by two 150-horsepower electric motors that turn 16-foot sheave wheels atop the bridge's two towers.

Simplex-ANHYDREX

SIMPLEX WIRE & CABLE CO., 79 Sidney St., Cambridge 39, Massachusetts



NEOPRENE BELTS CUT OPERATING COSTS because only neoprene conveyor covers offer the *balanced* resistance to chipping, cutting, abrasion, heat, weathering, grease and oil needed for long, trouble-free performance. With neoprene, you get low operating and maintenance cost performance *plus* an important extra—mine safety, since neoprene does not propagate flame. That's why it pays to *specify neoprene*—the same tough, safe material used for jacketing *all* mine-trailing cable.

NEOPRENE

The rubber made by Du Pont since 1932

DU PONT

REG. U. S. PAT. OFF.

Better Things for Better Living . . . through Chemistry

FREE! THE NEOPRENE NOTEBOOK

Every issue contains new illustrated case histories, interesting articles, new ways to save with neoprene. Mail this coupon today to E. I. du Pont de Nemours & Co. (Inc.), Elastomers Division CO - 12, Wilmington 98, Delaware.

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IS LOW OUTPUT CUTTING INTO YOUR PROFITS?

Let this Goodman threesome show you the way to record tonnage!

21412

Goodman Type 2400 cuts coal at record speed. It moves anywhere in the mine . . . cuts anywhere in the seam . . . bugduster does an unmatched job of handling cuttings when machine is used as a bottom cutter. A 50 hp motor drives the cutter chain and a 25 hp motor powers the hydraulic system. Available in heights from 30″ to 34″. For higher coal, Type 2410, in heights of 40½″ to 44″.

21404

Goodman Type 965 loads up to 10 tpm in free coal, will handle rock and slate as well. It is easily maneuvered for close quarter work . . . discharge end swings or elevates for loading in any position. Two 20 hp motors drive gathering arms and conveyor chain. Tramming and hydraulic system powered by two 15 hp motors. Overall height 26½″.

21417

Goodman Type 670 shuttle car is tops for quick trip transfer of loads. Water level full capacity, with 8″ side boards and 33″ discharge and extension, is 173 cu. ft. (basic height 32″). Standard Goodman features include 4 wheel power steering, 4 wheel drive, 4 wheel brakes and hydraulic controlled cable reel.

With this threesome on the job there's not much excuse for the cutting, loading and transfer cycle to let you down. For low, intermediate or high coal there's a Goodman combination to keep things moving. The full story can do more good for you than it can for us. Can we give it to you without obligation?

GOODMAN

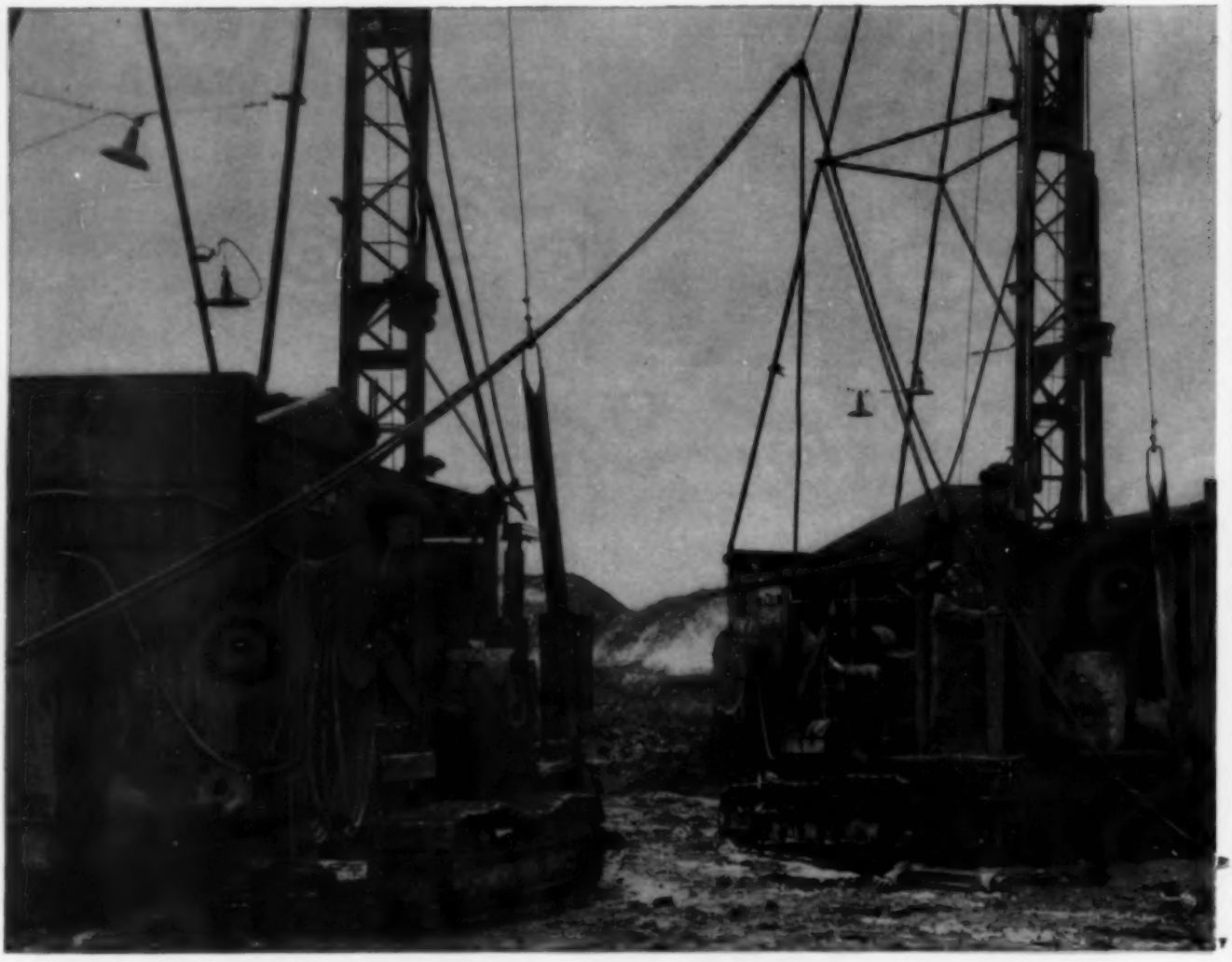
MANUFACTURING COMPANY

Halsted Street and 48th Place, Chicago 9, Illinois

CUTTING MACHINES • CONVEYORS • LOADERS
SHUTTLE CARS • LOCOMOTIVES • CONTINUOUS MINERS

Use Genuine Goodman Replacement Parts

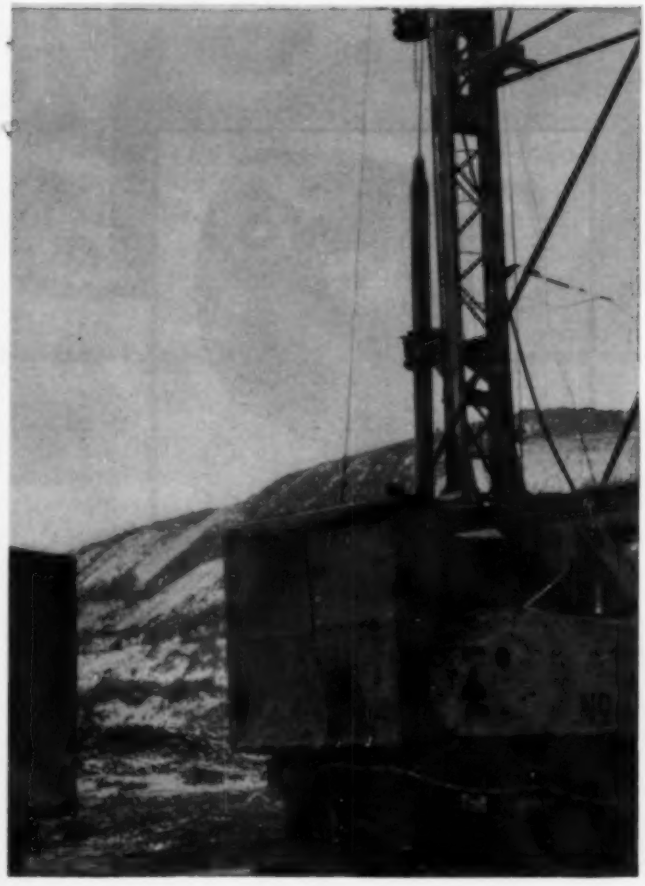
Tiger Brand Amerclad
in this



Extra flexible welding cable is shown. Fine stranded construction eases strain on operators' wrists.

Notice the flexibility. Tiger Brand is easy to handle.

does the three big jobs high production strip mine



Imagine the worst possible environment for electrical cable, and you'll find it at the strip mine shown in these pictures. The operators are plagued with underground fires, so severe that they have ruined the plastic windows in some of the power shovels. The rocks get so hot that you can't touch them or walk on them.

Despite the heat, the Tiger Brand Amerclad cable lies on the ground day in and day out, delivering dependable power 21¾ hours every day.

They do a lot of blasting at this mine, too. Although they try to protect the cable, it is pounded by large, sharp rocks almost every time there is a blast. Yet, when the pictures were taken, all the original cable was still in use, after *12 solid years of service.*

The mine owners point out that when a cable fails it costs money in down-time and replacement. The clincher is this: every foot of shovel cable, welding cable and drilling cable in the mine is Tiger Brand Amerclad.

Roughhouse service. That cable slung in the air and coiled on the sides of the drills is all Tiger Brand Amerclad.

AMERICAN STEEL & WIRE DIVISION, UNITED STATES STEEL
GENERAL OFFICES: CLEVELAND, OHIO

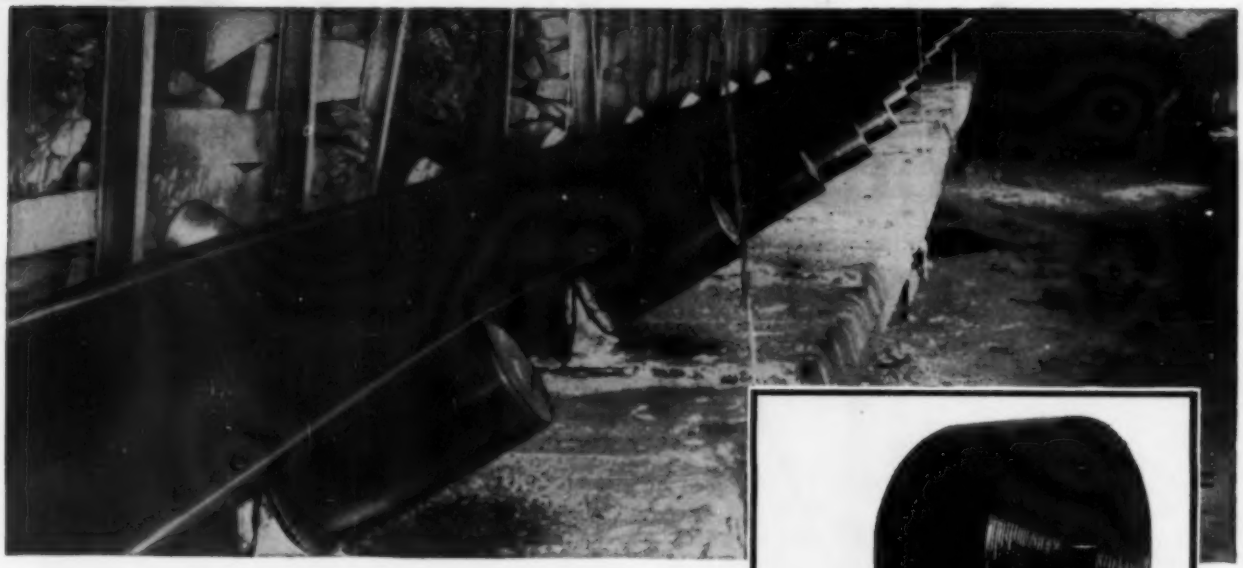
COLUMBIA-GENEVA STEEL DIVISION, SAN FRANCISCO, PACIFIC COAST DISTRIBUTORS
TENNESSEE COAL & IRON DIVISION, FAIRFIELD, ALA., SOUTHERN DISTRIBUTORS
UNITED STATES STEEL EXPORT COMPANY, NEW YORK

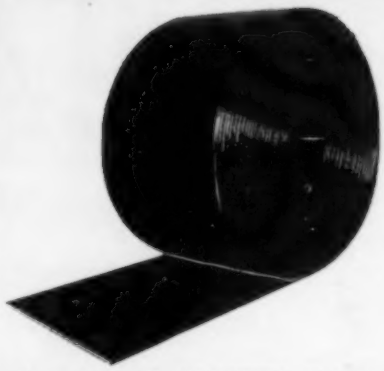
A STANDARD TIGER BRAND CABLE FOR EVERY SPECIAL JOB

- asbestos wire and cable
- paper & varnished cambric cable
- mold cured portable cord
- machine tool & building wire
- shovel & dredge cable
- special purpose wire & cable
- aerial, underground and submarine cable

USS Tiger Brand **ELECTRICAL WIRE & CABLE**

UNITED STATES STEEL





Inset shows roll of SCANDURA. Photo at left shows Face Conveyor in coal mine.

SCANDURA

the original P. V. C. fireproof

MINE Conveyor BELTING

One of the great hazards of mining — fire caused by a belt stalled over a still-rotating driving drum — is eliminated by new SCANDURA BELTING . . . . the original P. V. C. Conveyor belt which was developed in the United Kingdom and now manufactured by us in our Charlotte, N. C. plant.

Other unique SCANDURA features:

- *Its resistance to abrasion is superior.*
- *Fastener holding qualities are unusually good.*
- *The coating will not separate from the belt and will not rip or "dog-ear".*
- *The Solid Woven construction greatly reduces the possibility of mechanical damage.*
- *Stretch is not excessive.*
- *Works in temperatures ranging from 10° below to 212° above.*
- *IT IS NON-INFLAMMABLE—the ROT-PROOF Treatment protects body of the belt from mildew.*

SCANDURA has been tested and used with gratifying results in Britain since 1946 and is now being installed in American Coal Mines. For safety and economy, *it's in a class by itself.*

Exclusive Distributors *For the Mining Industry East of the Mississippi*

NATIONAL MINE SERVICE COMPANY

Suite 564, Alcoa Building, Pittsburgh 19, Pa.

SCANDINAVIA BELTING COMPANY

744 Broad Street (P. O. Box 464), Newark 1, New Jersey

PLANT: Charlotte 1, N. C. BRANCH: Cleveland 14, Ohio

Fiatt, Illinois Mine uses **STANOIL** *Industrial Oil in stripper hydraulic jacks for 18 years*

At Truax-Traer Coal Company's Fiatt, Illinois, mine, the production goal is 1,000 tons of coal an hour. That's a stiff assignment. It leaves no margin for failure. This indeed applies to the hydraulic jacks of the company's Bucyrus-Erie 950-B stripper. It's the reason STANOIL Industrial Oil has been used as the hydraulic fluid in the four hydraulic jacks since the stripper went into operation in 1937. Eighteen years continuous service is testimony to STANOIL's ability to deliver under any operating condition—heat, cold, rain, dust, dirt.

But there's more to the story than just the ability of STANOIL Industrial Oil to deliver under a wide range of operating conditions. The rest of the story is the Standard technical service provided by men with training and experience.

This combination — (1) top quality products (2) technical service provided by experienced men — is ready to serve you. Want this combination to go to work for you? In the midwest just call your nearby Standard Oil lubrication specialist. Or contact: Standard Oil Company, 910 South Michigan Avenue, Chicago 80, Illinois.

Since start of operations in 1937, STANOIL Industrial Oil has been used as hydraulic fluid in Bucyrus-Erie stripper at Truax-Traer Coal Company mine, Fiatt, Illinois. This 950-B stripper is hub of one of the biggest strip mining operations in Fulton County, state's second largest coal producing county.

Bob Wright, Standard Oil lubrication specialist is on the spot to provide technical service on lubrication problems. Bob has a B.S. in engineering from Michigan College of Mining. Before entering field sales work, Bob completed Standard's Sales Engineering School course in industrial lubrication. Customers find this experience and background pay off for them.

STANDARD

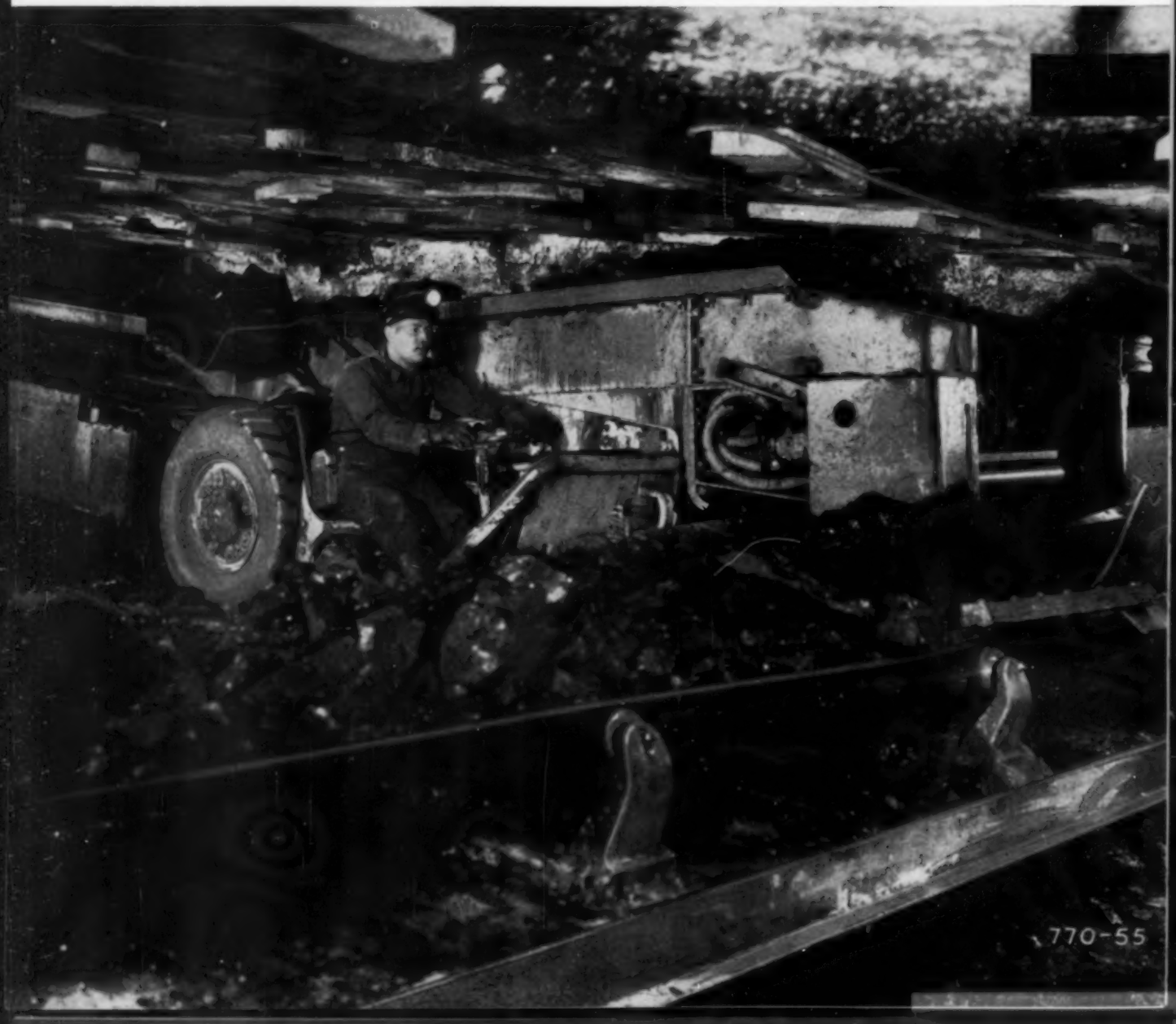
STANDARD OIL COMPANY
(Indiana)

team up **JEFFREY SHUTTLE CARS**

and **JEFFREY BELT CONVEYORS**

for speedy, low cost coal transportation

A Jeffrey Class 66 shuttle car discharges coal directly into a Jeffrey 80-A belt conveyor at a large Kentucky mine.



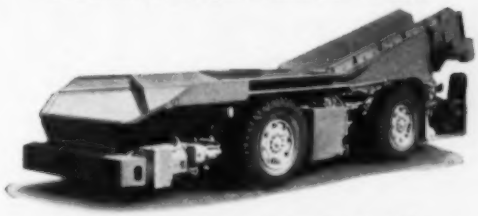
Choose from these three classes of JEFFREY SHUTTLE CARS to match your mining height

They carry big payloads and haul the coal away *fast*. 4-wheel drive, 4-wheel steering and 4-wheel braking make them safe and easy to maneuver under every mining condition. All have hydraulically driven conveyor and cable reel. Conveyor can be run slow for "jogging" when loading, slow or fast when unloading, and its direction can be reversed.

Jeffrey shuttle cars are built for continuous, rugged service.

Class 68 in heights from 24" to 32"

Class 66 in heights from 30" to 48"



Class 67 in heights from 44" to 60"

...and BELT CONVEYORS to meet your exact requirements from the complete Jeffrey line

Three types of head sections can be combined with three types of frames, giving you nine combinations to meet any belt conveyor requirement. Jeffrey engineers will help you select the right combination for each gathering, slope or main line haulage job.

These three husky head sections can transmit from 25 to 160 HP for belt speeds from 150 to 600 FPM. Tandem drive puts the conveyor belt in maximum contact with two gear-meshed drive pulleys for most efficient use of power on a long pull.

The three frames are built for belt widths from 26" to 48", and idler roll sizes range from $2\frac{9}{16}$" to 6" dia.

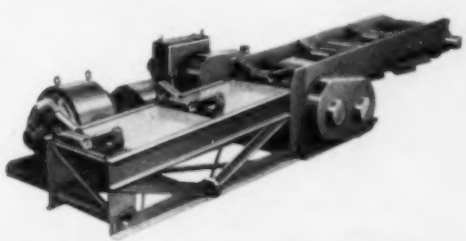
With Jeffrey shuttle cars and belt conveyors, you are assured of high-tonnage handling at low cost, less downtime and low maintenance.

The Jeffrey Manufacturing Company Columbus 16, Ohio

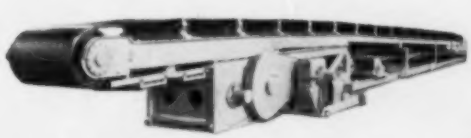
JEFFREY

MINING • CONVEYING • PROCESSING EQUIPMENT
TRANSMISSION MACHINERY • CONTRACT MANUFACTURING

52-B Head Section for 25 to 75 HP motors. 52-B frames are made for 26", 30", and 36" belts, and $2\frac{9}{16}$" or 4" diameter idler rolls.



64-A Head Section for motors up to 125 HP. 64-A frames are made for 30", 36", and 42" belts, with 4" diameter idler rolls.



80-A Head Section for motor drives up to 160 HP. The 80-A frame is adaptable to 30", 36", 42" and 48" belts, and 4", 5" or 6" dia. idler rolls.

International distributor delivers...

500 TD-24's

For pioneering and road building in the rugged northwest

Howard-Cooper Corporation, one of International's 31 Western area distributors, have just delivered their *500th TD-24!*

You see this big 200 bhp crawler already at work for Wooley Logging Company, Drain, Oregon.

In rough, tough, Pacific Coast, big-scale logging, mining, and earthmoving, profitable production depends upon positive load-control, up-grade or down. *The TD-24 is the only tractor built that has planet-power steering—which gives you constant load control on both tracks when turning.* That's why the TD-24 out-produces the others so decisively, with dozer, arch, or scraper! Another big TD-24 advantage is its built-for-the-West construction. Records, on fleet after fleet, prove that TD-24's stand up under the toughest conditions—and consistently cost less for maintenance than any other make on tracks! TD-24 high-altitude performance is a big advantage, too—so is its seconds-fast, cold-weather starting and operating ease!

Oregon's 500th TD-24 is already at work. Here, it clears trees and stumps for a new, main truck-haul road near Brush Creek. "I like its torque converter," says Operator Dean Russum. "You get more power without track slippage and you no longer rough up the machine with shock loads."

TD-24's

6 for A. J. Orlando on Massachusetts Turnpike—Most of the tractor work on this Whiteside (N.Y.) contractor's 4.89-mile, 2,500,000-yard, $3,340,000 section of the Massachusetts Turnpike is being done by TD-24's. One pushing 3 scrapers accounts for 4,500 pay yards every 10 hours (scrapers on 1,500-ft. one-way hauls). Others pull rippers, level fills, etc.

If you're in the market for a big tractor, you owe it to yourself to check the leader . . . the International TD-24. Five-hundred owners in just one area have proved it their "Best Buy." If it can so successfully and so profitably lick the tough rock, cold weather, and mountain grades of Oregon, it can successfully and profitably lick your high-cost jobs, too! Let us prove its advantages with a demonstration. Call to arrange time and place.

PAY OFF ACROSS THE COUNTRY

6 for J. D. Armstrong on Kansas Turnpike—Of their 9 TD-24's, this Ames (Iowa) contractor reports all have run 5,000 hours or more before needing any repair work. Six on 1.7-mile, million-yard Turnpike section near Emporia, are towing 50-ton rollers, pulling and push-loading scrapers. On hauls of 700 to 2500 ft., they account for 5,000 pay yds. per day.

2 for J. W. Moorman on Buford Dam, Georgia—These "24's", two of the five now owned by Moorman, push-loaded scrapers or pulled 50-ton rubber-tired rollers, 18 hours every day for 18 months. On compaction, they averaged 180,000 cubic yards weekly for the 200-ft.-high, 1630-ft.-long main dam. Moorman's other TD-24's are used to push-load scrapers, and pull or push belt loaders.

3 stripping overburden for Meyer Bros., Pennsylvania—"Proven crawlers," says Partner George Meyer of his TD-24's. "We've used our 3 for 3 years now. They have good balance plus unmatched push power." Right now, rigs are removing 30 feet of shale and clay to uncover a 30-inch vein of bituminous coal. The 2 TD-24's do 80% of the job; a large shovel, 20%.

International Industrial Power

INTERNATIONAL HARVESTER

PAYSCRAPERS
13 yds. and 18½ yds.

WHEEL TRACTORS
8 Models . . . . 9 to 59 dbp

CRAWLER TRACTORS
6 Models . . . . 40 to 200 hp

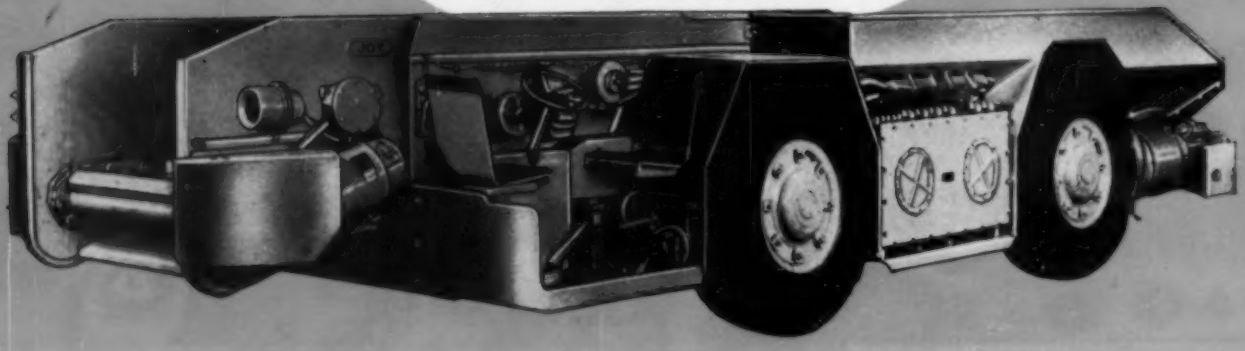
DIESEL, GAS ENGINES
18 Models, 16½ to 200 hp

ALSO: International Draft Loaders . . . International Scrapers, Bottom-Dump Wagons . . . and International Superior Pipe-Beam Tractors.

A machine size for every job . . . see your nearest INTERNATIONAL DISTRIBUTOR for details.

THE JOY 10-SC SHUTTLE CAR...

★ Won't slap on bumps
★ Won't skid on grade turns
★ Gets out of bad spots with ease
★ Readily trams up a 12% grade



The improved Joy 10-SC Shuttle Car is available as a Permissible or Non-Permissible unit, for net payload capacities up to 10 tons. It is built in 43", 48" or 54" heights (machine only) and may be equipped with 4", 6" or 8" sideboards. Tramming speed loaded is approximately 4.2 m.p.h., and the unit is equipped with Joy-pioneered hydraulic cable reel, and hydraulically adjustable elevating discharge.

NOW AVAILABLE—SUPER 10-SC

Special 10-SC with two 25 HP motors and heavier wheel units is now available for heavy-duty application on excessive grades. Field-tested in a Utah mine.

CAN MAKE MONEY FOR YOU!

It gets from the Face to the Discharge Point and back again faster than any other car on the market

This latest model 10-SC is away out in front—more than ever before the world's leading shuttle car for heavy-duty, high-production service. Particularly ideal for full-seam mining because it can handle full loads of coal or rock with equal ease, the 10-SC Shuttle Car is now capable of new potentials in productivity, maneuverability, and dependable performance with lowest maintenance.

MORE ROUND TRIPS PER SHIFT

This improved shuttle car can travel, discharge and return faster than any other car in its class. That means more pay-loads per shift—and it may also mean more efficient use of other equipment, such as Continuous Miners, Loaders, Belt Conveyors, etc.

15 HP traction motors of new design provide more dependability and more reserve power for increased speed, maneuverability and carrying capacity. Wheel units and brakes are of over-capacity size for continuous heavy-duty service, and the gearing and frame are also over-capacity. Higher speed conveyor discharge, with higher-HP motors, actually gets discharge time down to three-quarters or half the time formerly required.

OTHER JOY-PIONEERED FEATURES

As in previous models, the 10-SC has 4-wheel positive steering, 4-wheel drive and 4-wheel brakes. The hydraulic "power steering" innovation in the automotive world has been a standard patented feature of Joy Shuttle Cars for years . . . one of the reasons for their high maneuverability.

The 10-SC's smooth, grab-free disc-type brakes (the type widely used on aircraft) were also pioneered by Joy for underground use. They provide exceptional stopping power with extreme simplicity and low maintenance . . . ideal for mining use because they're unaffected by dirt, coal dust, oil or water.

Other features of the new 10-SC include: improved arrangement of operator's controls for fool-proof driving; improved "zone" lubrication for fast, easy servicing; the famous Joy "Magnetax" controls, etc. • For full data, address ***Joy Manufacturing Company, Oliver Bldg., Pittsburgh 22, Pa. In Canada:*** *Joy Manufacturing Company (Canada) Limited, Galt, Ontario.*

Consult a Joy Engineer

JOY

WORLD'S LARGEST MANUFACTURER OF UNDERGROUND MINING EQUIPMENT

WAD CL5876-31

This could be a bottleneck

An intersection of haulageways like this one in a large West Virginia mine *could* mean frequent derailments, coal spillage, constant attention by the maintenance crews.

But, for a very good reason, this particular track layout causes none of those headaches. Instead, it carries heavy traffic smoothly, at normal running speed, with no more than routine maintenance inspection.

The reason? This trackage is Bethlehem-designed, Bethlehem-built, Bethlehem-preassembled. All rail used here is 60-lb rail to assure good performance even under the heavier loads expected tomorrow. All turnouts were tailor-made for this specific spot, and every component painstakingly pre-fitted at Bethlehem's plant to prevent any bugs at the job site.

Yet for Bethlehem, this was not a "special" job. Every mine-track problem gets the full treatment, as you will find when you consult a Bethlehem engineer about your workings. You'll like his cooperative attitude and his intimate knowledge of mining that lets him keep right up with you as you outline what you have in mind.

With the country's energy requirements spiraling upwards, it seems clear that your trackwork will be carrying an even greater burden. Is it really up to the task, in every respect? Now is the time to get the answer, and a Bethlehem engineer is ready to help you find it.

BETHLEHEM STEEL COMPANY
BETHLEHEM, PA.

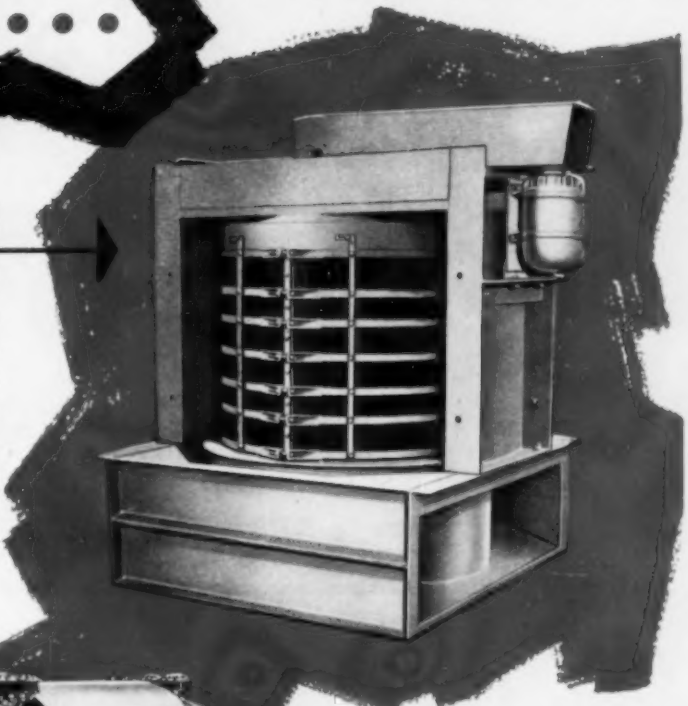
On the Pacific Coast Bethlehem products are sold by Bethlehem Pacific Coast Steel Corporation. *Export Distributor:* Bethlehem Steel Export Corporation

BETHLEHEM STEEL

Specify

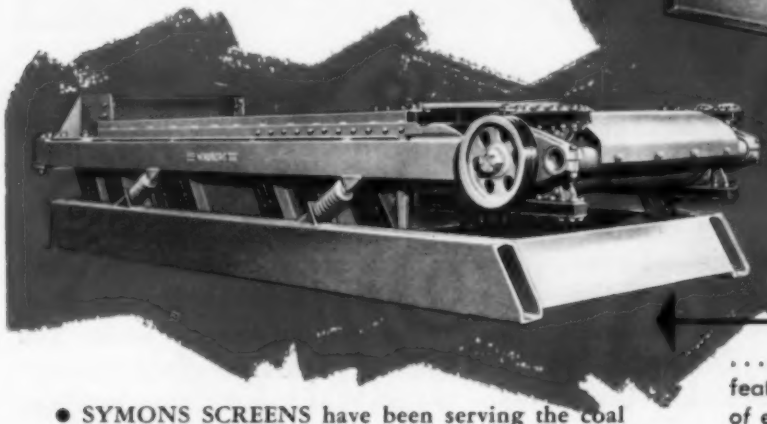
SYMONS SCREENS . . .

for LOW COST
MORE EFFICIENT
Coal Preparation Service



SYMONS V-SCREENS

. . . the only vibrating screen that does not depend upon gravity alone to size or dewater. By combining centrifugal force with gravity, the V-Screen does a better screening job — makes sharper separations — gives you a much dryer product with less degradation than other dewatering methods . . . and requires only 5 H.P. to operate under full load.



SYMONS HORIZONTAL VIBRATING SCREENS

. . . in a wide range of sizes and types, all featuring: less breakage and degradation of even the more friable coals — greater uniformity in graded sizes — wide range of separations — simple, low cost installation — low maintenance cost — easily enclosed, with entire drive mechanism outside of housing.

● SYMONS SCREENS have been serving the coal industry for almost twenty years, in hundreds of screening applications throughout the world. These quality screens have gained an enviable reputation for dependability, efficiency and economy . . . backed by the same high standards of accuracy, design and workmanship that are used in the manufacture of *all* Nordberg Machinery.

SYMONS . . . *A REGISTERED NORDBERG TRADEMARK KNOWN THROUGHOUT THE WORLD*

NORDBERG MACHINERY

NORDBERG

SYMONS SCREENS NORDBERG

MACHINERY FOR PROCESSING ORES and INDUSTRIAL MINERALS
NEW YORK • SAN FRANCISCO • DULUTH • WASHINGTON
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CA

NORDBERG MFG. CO., Milwaukee, Wisconsin
Please send me further information on the following screens

☐ Symons V Screens ☐ Symons Rod Deck Screens
☐ Symons Horizontal Screens ☐ Symons Grizzlies

Name _____ Title _____
Company _____
Address _____
City _____ Zone _____ State _____

© 1955, Nordberg Mfg. Co. $255

with Gulf Mining Machine Lubricant

Extra steps, extra applications, and extra handling cost money. Progressive mining concerns have found they can eliminate these costly extras with Gulf Mining Machine Lubricant. This cost-saving lubricant can often do the entire lubricating job at the face, thus simplifying lubricant storage and handling. It also lessens the danger of application errors. Avoid the extras—when you can do the job with one grease, why use more?

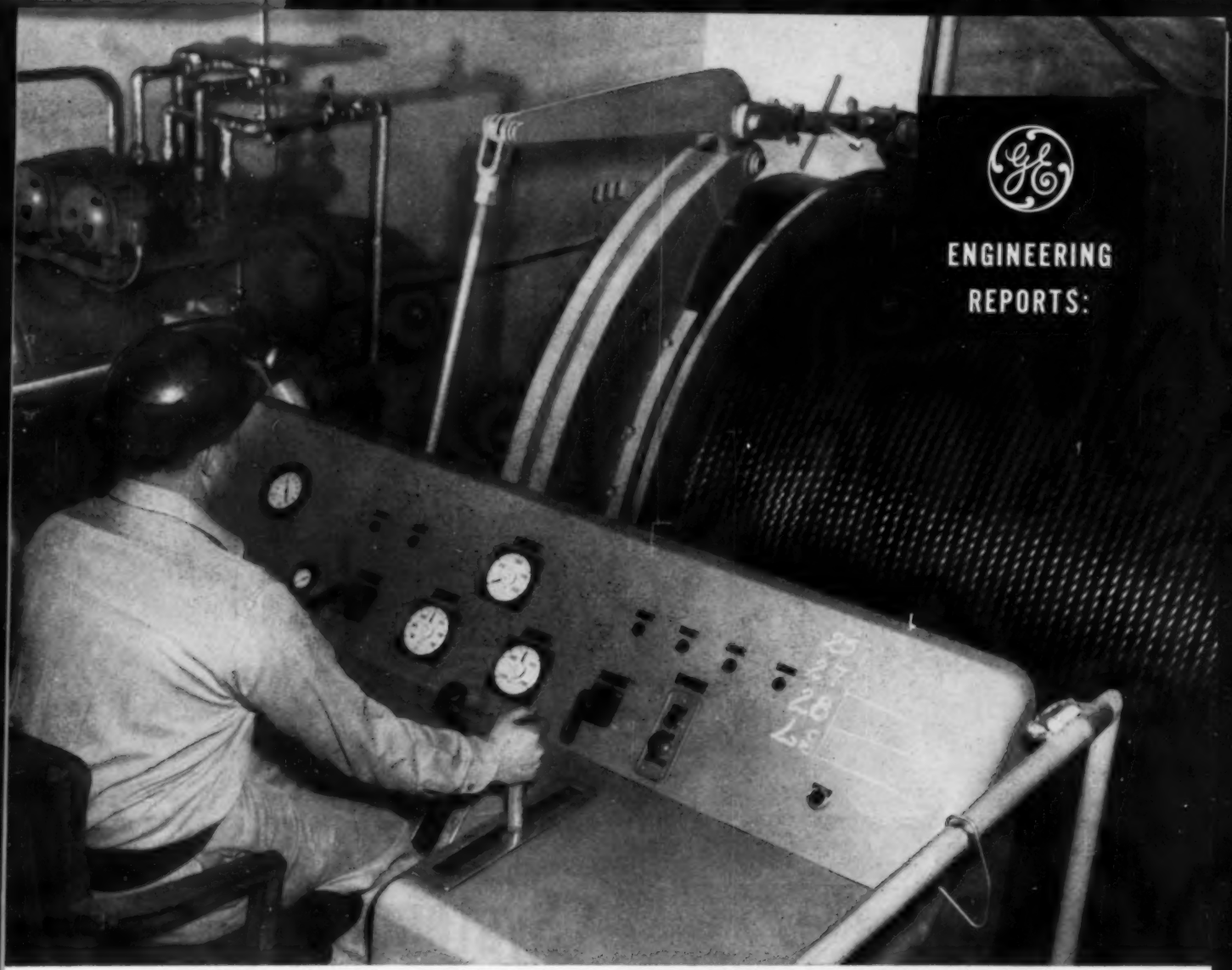
Gulf Mining Machine Lubricant not only replaces several other lubricants, but does a better job because of its heavy body, excellent adhesiveness, and resistance to the washing action of water. You will find that it provides effective protection for plain and antifriction bearings, crawler mechanisms, and gear boxes.

A Gulf Sales Engineer is as near as your telephone. Consult the telephone directory for the number of your local Gulf office and have him demonstrate the many time-saving, cost-cutting advantages of Gulf Mining Machine Lubricant on your equipment.

GULF OIL CORPORATION • GULF REFINING COMPANY
1822 Gulf Building, Pittsburgh 30, Pa.

GULF

THE FINEST PETROLEUM PRODUCTS FOR ALL YOUR NEEDS



CUSTOM-BUILT G-E manual or automatic mine hoist drives are available in many types for heavy-duty hoisting.

G-E electrical systems and equipment help you . . .

Mechanize underground mining for more tonnage at lower cost

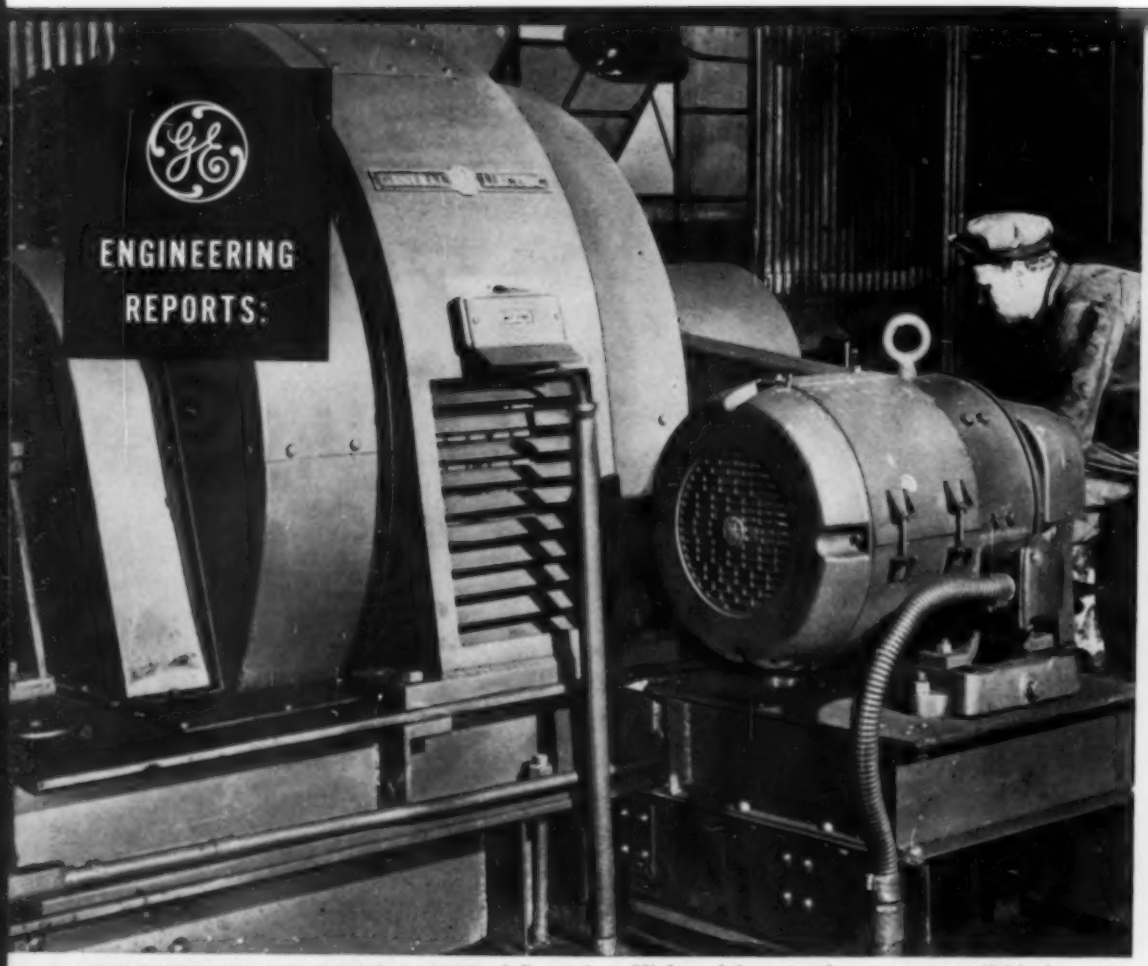
As market conditions change, underground mines must produce more, faster, and more efficiently, to improve their competitive position. Key to this objective is increased mechanization, with General Electric's help.

You benefit many ways when you specify G-E electrical systems and equipment. Advantages like these can play an important part in your mine mechanization program:

- **FACTORY-ASSEMBLED** G-E power-system equipment cuts installation time and cost, speeds new construction and start-up.
- **SPACE-SAVING** G-E electrical equipment adapts readily into existing systems, can be expanded easily, at low cost.
- **LOW-MAINTENANCE** G-E drives are designed to last longer, provide more horsepower in limited space, with maximum accessibility for servicing.

TURN PAGE FOR MORE PRODUCT INFORMATION

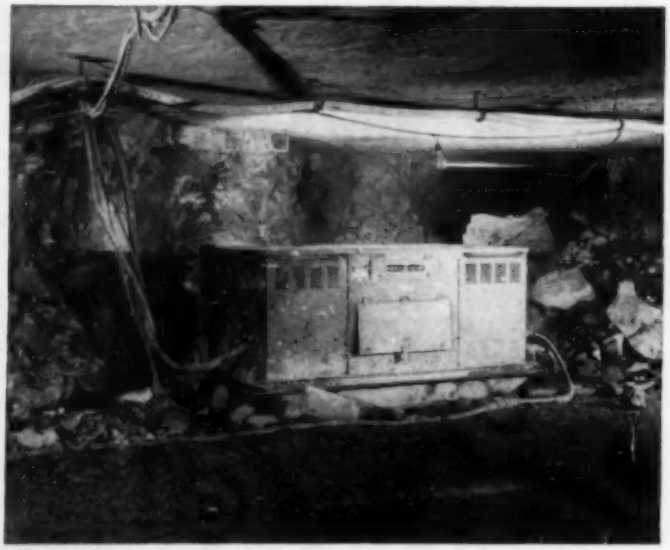
GENERAL ELECTRIC



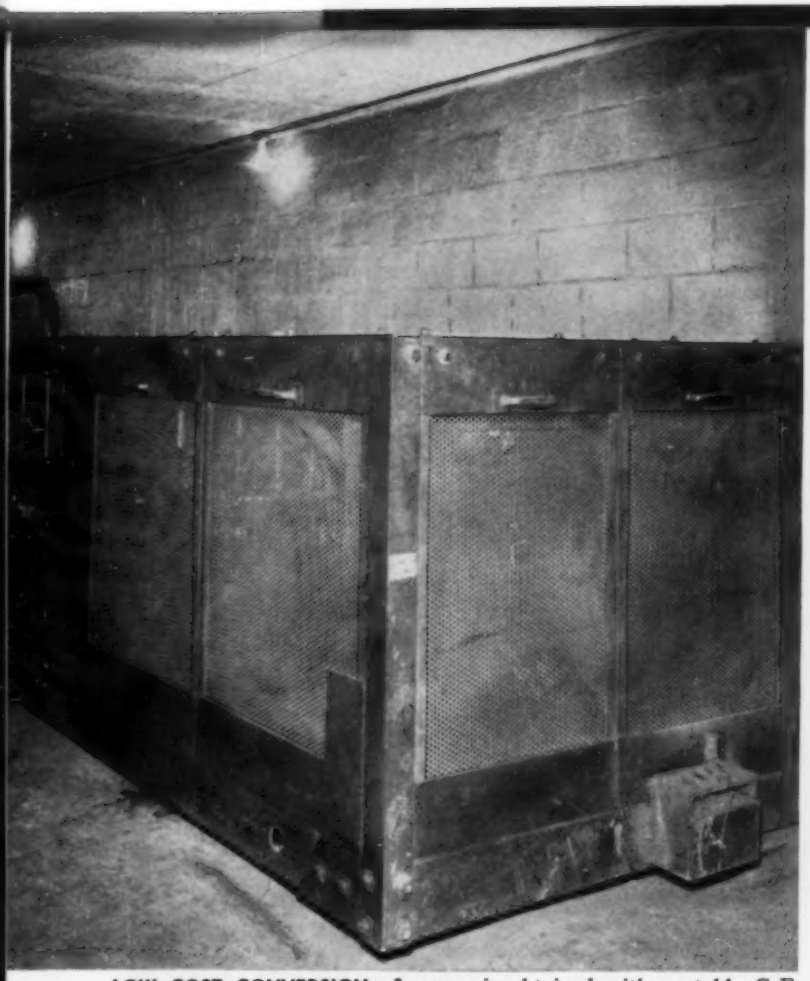
HIGH EFFICIENCY AND POWER FACTOR of General Electric synchronous conveyor or compressor motors cut electrical losses, and can reduce power rate. High and low speed types are available in many sizes, with just the required type starting, pull-in, and pull-out torque.

System-engineered raises efficiency of

CONTINUITY OF PRODUCTION and flexibility of operation are promoted by G-E metal-clad switchgear. Factory-assembled, it is easily installed and maintained.



MORE DEPENDABLE G-E a-c mine power supply, used underground, steps down voltage close to the mining load, minimizing voltage drop, increases the efficiency of your mining machines.



LOW COST CONVERSION of power is obtained with portable G-E mining-type mercury-arc rectifiers. Move easily as face advances. Absence of major rotating parts reduces wear, shutdowns.

SPECIALLY DESIGNED for service reliability, rugged G-E totally enclosed fan-cooled Tri-Clad* motors are also available in design approved by Bureau of Mines.

G-E equipment underground mining

Modern General Electric equipment can give you the speed, flexibility and safety you need for more efficient underground mining. G.E. can also help in these ways:

Latest electrical techniques are employed by G-E application engineers, working closely with you or your consultants, to give you the most flexible and lowest-cost system for your mining needs.

Extensive developmental facilities are constantly used by G-E product engineers in providing new and improved products to help you increase mining output and efficiency.

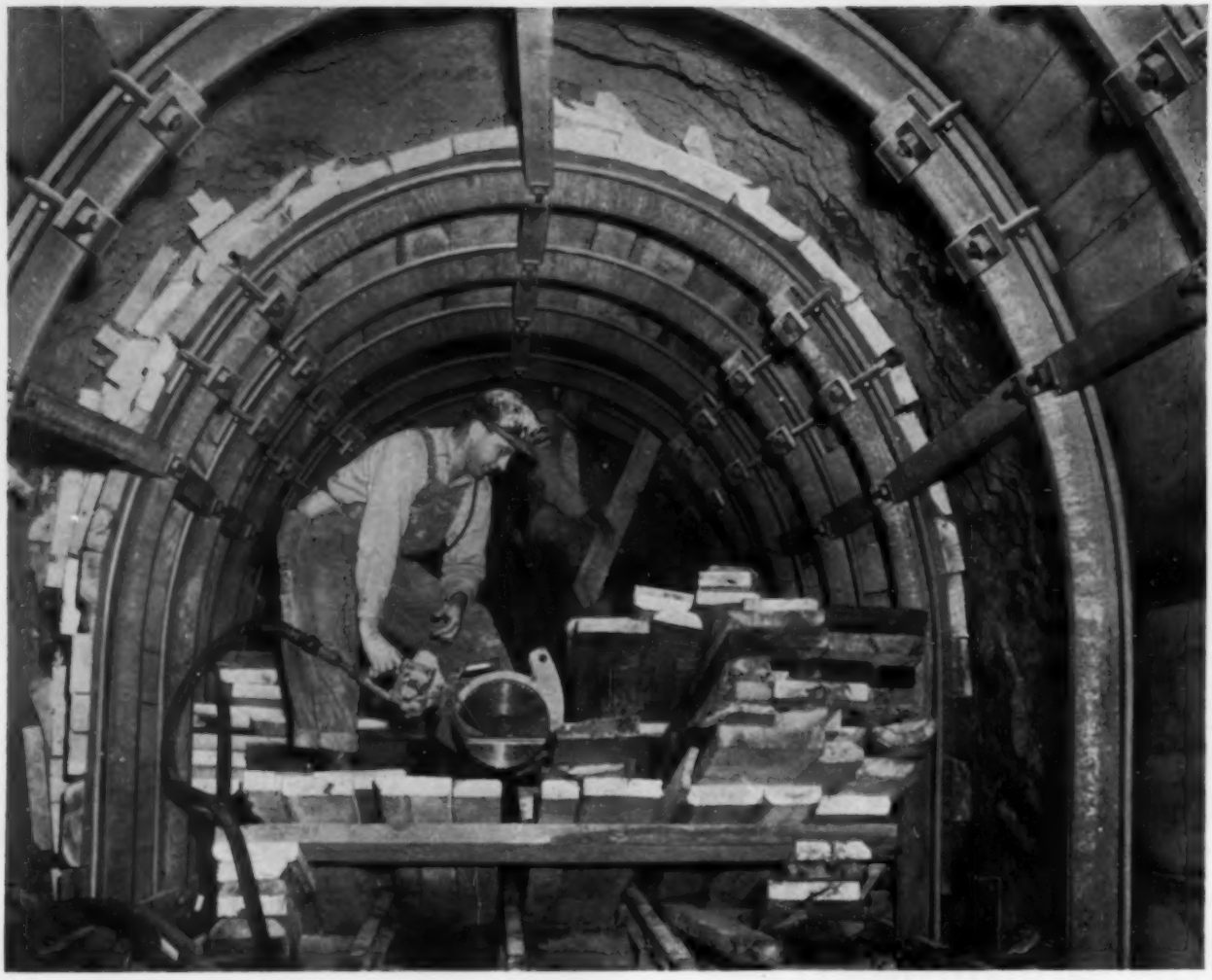
From early plans through start-up, G.E. can co-ordinate selection, delivery and installation of all your electric equipment, saving you engineering time and construction costs. For more information, contact your nearest G-E Apparatus Sales office, or write General Electric Co., Schenectady 5, N. Y. 660-33

HIGH AVAILABILITY of G-E mine locomotives cuts costs. G.E. offers a variety of types which handle easily, efficiently, and help speed all haulage in underground mines.

*Reg. trade-mark of General Electric Co.

Engineered Electrical Systems for Underground Mining

GENERAL ELECTRIC



Yieldable Mine Roof Support Means Greater Safety and Less Cost

We're in a slusher drift at an Eastern ore mine. The workmen have completed the erection of those steel arches and are now installing lagging to finish off the job.

The arches have probably caught your eye, and well they might for they represent one of the greatest advances in mine safety in recent years. From now on, you will be hearing a lot about the Bethlehem Yieldable Mine Arch!

Each arch consists of rolled-steel segments, nested into one another and bolted together at points of overlap. Joints are made with U-bolt clamps drawn tight enough to hold fast under normal loads. But when unusually heavy pressures begin to bear down, the joints permit the nested segments to slide or yield before deformation of the steel can take place. The load is thus relieved and the structural integrity of the arch is maintained. The safety of underground personnel is secure, and the roof structure itself continues in service undamaged.

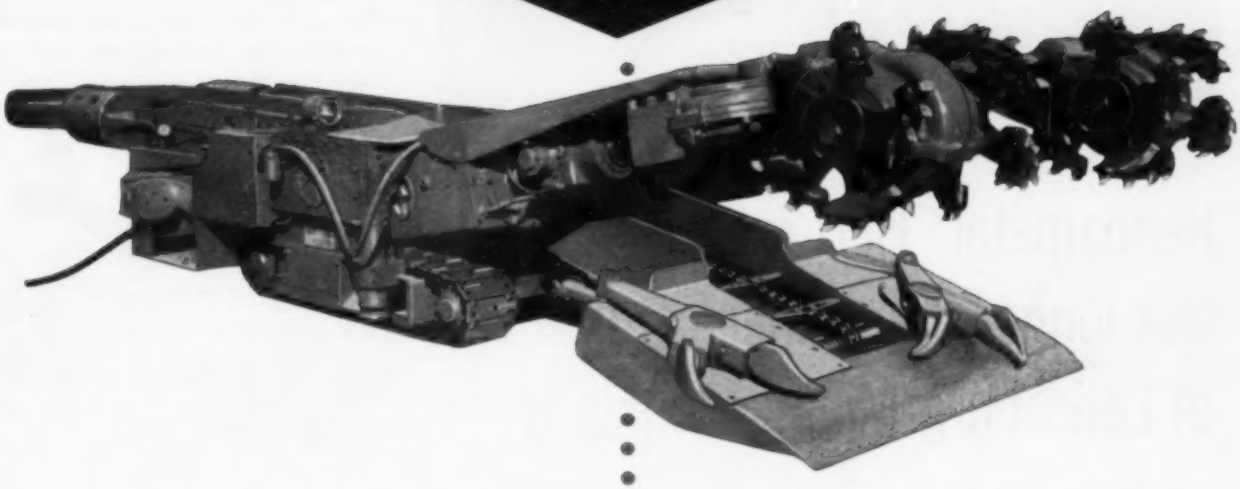
The impressive appearance of the Yieldable Arch may suggest a luxury item, but exactly the reverse is true. The fact is, you can safely figure on regaining the reasonable first cost of the Yieldable Arch in its first year of service. These steel arches will far outlive heavy timber supports, and have the very important advantage of recoverability. One of our engineers will be glad to describe this safety development in full detail at your convenience.

BETHLEHEM STEEL COMPANY
BETHLEHEM, PA.

On the Pacific Coast Bethlehem products are sold by Bethlehem Pacific Coast Steel Corporation. Export Distributor: Bethlehem Steel Export Corporation

BETHLEHEM STEEL

8 important REASONS why you should choose the Lee-Norse MINER



1. The Lee-Norse Miner cuts and loads coal at a rate of 2 to 3 tons per minute.
2. The Lee-Norse Miner is the only machine that cuts continuously a "DIAMOND PATTERN" in the face of the coal. This new and unique method of cutting coal produces "Coarse Cuttings" and less fines.
3. The Lee-Norse Miner is built like a modern Coal Loading Machine with improved "DUAL" gathering arms and flexible conveyor and with the exclusive Lee-Norse Cutter Head, which cuts from the roof down to the floor and gathers all the coal as it is cut.
4. The Lee-Norse Miner operates with the same electric power, now provided for conventional mechanical mining—No need for larger power facilities.
5. The Lee-Norse Miner, built like a flexible, mobile loader, has excellent clean-up . . . no need for auxiliary loading machine.
6. The Lee-Norse Miner is designed for easy maintenance. All gear drives, electric motors and hydraulic pump and motors are located on the outside, where they can be attended to quickly. No swinging head or turntable -no chain drive-makes for less maintenance.
7. The Lee-Norse Miner has "Low Bit Cost" due to the solid mounting of cutter bits and unique method of cutting coal.
8. The Lee-Norse Miner is well proportioned in size and weight to suit present day mining conditions. With simple control and high tramming speed it operates and moves like a modern mobile loader and not like a semi-stationary miner.

Write today for literature:

Lee-Norse Company

CHARLEROI, PA.

Specialists in Coal Mining Equipment

This special drill rig, designed by Anthony Schacikoski, General Superintendent of Leechburg's mining operations, makes drilling easier — takes full advantage of Kennametal roof bits and the Jeffrey drill.

Kennametal* HFD roof bits last longer than other carbide bits at Leechburg Mining Company

At Leechburg Mining Company's Park Mine, tests were made of Kennametal HFD 1⅜-inch roof bits and other carbide bits of the same diameter. Using a Jeffrey A-7 Drill with shop-made rods and drilling rig, holes two feet deep were drilled into hard, brittle slate having a one-inch pebble streak.

Four holes were drilled with the other carbide bits under test before reconditioning was necessary. Under the same conditions, 14 holes were drilled with Kennametal before resharpening, reducing bit cost to ⅓ of what it was formerly.

Kennametal bits last longer because they're made better. They have shock and wear-resistance qualities superior to any other tungsten-carbide bits in the industry. Try them. Your bit costs will be less. You'll spend less time resharpening and changing. You'll drill more holes per man, per machine, per hour. Your Kennametal representative, a veteran having many years of mining experience, will help you put the right tool on the job. Call him, or write: KENNAMETAL INC., Mining Tool Division, Bedford, Pennsylvania.

National Mine Service Company

National Mine Service appointed Kennametal dealer

Complete stocks of Kennametal mining tools are now available at all National Mine Service warehouses . . . Indiana and Forty-Fort, Pa., Beckley and Logan, W.Va., Jenkins and Madisonville, Ky. Kennametal service and sales personnel work with those of National Mine Service in giving tool performance demonstrations and reconditioning instructions and to help you in tool selection.

A third less manpower A third more drilling

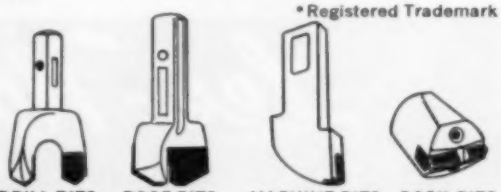
Use of the Kennametal RD 1⅝-inch bit resulted in both easier drilling and lower drilling cost in an anthracite measure at Rogers Bros. Co., Scranton, Pa. Simply by changing to this bit, two men are now drilling ⅓ more each shift than previously drilled by three men in the same length of time.

New—Uranium prospector's drill

Kennametal recently introduced a carbide-tipped hand drill for uranium prospectors. This new tool stays sharp much longer than conventional drills, greatly reducing the load of drills to be carried into remote prospecting areas.

*Registered Trademark

INDUSTRY AND **KENNAMETAL** . . . *Partners in Progress*



DRILL BITS ROOF BITS MACHINE BITS ROCK BITS

75 YEARS OF BUCYRUS-ERIE LEADERSHIP . . .

December 18 marks Bucyrus-Erie's 75th Anniversary. In the years since 1880, the company has been proud to bring many significant advancements to the design of excavators . . . the first electric and the first diesel excavators . . . the first crawler-mounted dragline . . . the first heavy-duty, full-revolving quarry and mine shovel . . . and too many more "firsts" to detail here. Most important, however, the know-how back of these is yours in whatever Bucyrus-Erie machine you use.

President Theodore Roosevelt Visits Panama Canal: This Bucyrus-Erie shovel, one of 77 used on the Big Ditch, was included in his 1908 inspection tour.

This Bucyrus-Erie 1050-B shovel swings a big 45-cu. yd. dipper, keeps overburden costs low for Ohio coal mine.

. . . GIVES YOU TOP PERFORMANCE TODAY . . .

You can expect top performance from a Bucyrus-Erie excavator because its *built right in* — from the ground up. Bucyrus-Erie has pioneered the use of Ward Leonard control which gives the operator smooth, efficient control over all operating functions. Front end provides strength to withstand shock loads of digging, yet is remarkably light in weight to hold down swing inertia. Main machinery is simple and strong for most efficient operation and long service life. The extras Bucyrus-Erie puts into the design and construction of excavators pay off many times over in added output and lower cost operation.

. . . PROMISES EVEN BETTER EXCAVATORS TOMORROW

You can expect even higher performance standards from Bucyrus-Erie excavators in years to come. The development of new and improved designs, and the search for better materials and more efficient manufacturing methods never ends. With facilities unsurpassed in the industry, Bucyrus-Erie promises you excavators that will serve you better than ever. 22Y55C

1880 BUCYRUS ERIE *1955*

South Milwaukee, Wis.

75 Years of Service to Men Who Shape the Earth

GENERAL CABLE

THE GREATEST NAME IN ELECTRICAL WIRE AND CABLE

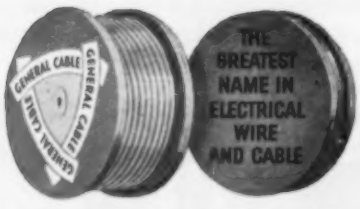
Widely used on electric shovels, dredges, mine locomotives, shuttle cars, mining machines, blast hole drills, mixers, welders, magnetic cranes and other portable power equipment...new, improved SUPER SERVICE will furnish longer life and reliable service under the most severe operating conditions.

With its new SUPERTUF metal mold cured jacket and new THERMAX insulation...the new SUPER SERVICE has no equal for safety, for durability, for continuity of service!

SUPER SERVICE resists *all* the costliest hazards far beyond the accepted field requirements. It resists flexing, crushing, impact, tearing, flame, heat, oil, chemicals, weather, and, most important, abrasion.

Result: a well balanced product that helps you to hold down overall operating and maintenance costs. Yet SUPER SERVICE costs no more than ordinary cables! Ask your friendly General Cable Representative or Distributor for complete data. And, remember, he represents the *only* manufacturer who can supply *all* your electrical wire and cable needs!

GENERAL CABLE
CORPORATION



BARE, WEATHERPROOF, INSULATED WIRES and CABLES FOR EVERY ELECTRICAL PURPOSE

GENERAL CABLE CORPORATION
Executive Offices: 420 Lexington Ave., New York 17, N. Y.

SALES OFFICES: Atlanta • Baltimore • Boston • Buffalo Chicago • Cincinnati • Cleveland • Dallas • Dayton • Denver Detroit • Erie (Pa.) • Greensboro (N. C.) • Houston Indianapolis • Kansas City • Lincoln (Neb.) • Los Angeles Memphis • Milwaukee • Minneapolis • New Haven • New Orleans • Newark (N. J.) • New York • Philadelphia Pittsburgh • Portland (Ore.) • Richmond (Va.) • Rochester (N. Y.) • Rome (N. Y.) • St. Louis • San Francisco Seattle • Springfield (Ill.) • Syracuse • Tampa • Tulsa Washington (D. C.)

" We spent $900 on Stainless Steel and saved $30,000"

says **SHERWIN SORIN**
ATKINS COAL COMPANY
FRACKSVILLE, PA.

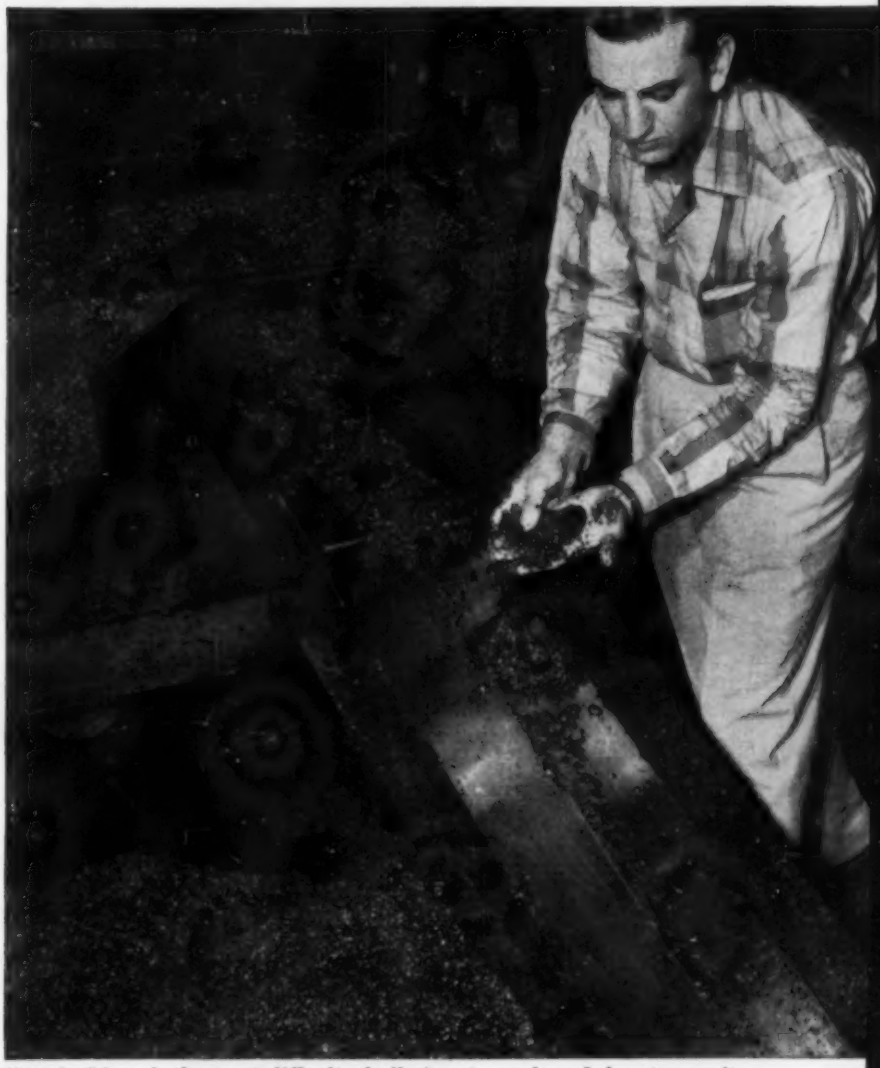
HERE'S THE STORY of Atkins Coal Company, in the words of Mr. Sherwin Sorin, Maintenance Manager:

"We spent $900 on Stainless Steel when we built our new coal breaker, and we have received a direct monetary saving of $30,000. We have done away with rust, erosion, corrosion and friction, reduced the pitch of the chutes, cut our water usage, improved efficiency by eliminating coal breakage, saved on construction, and have completely cancelled out our chute replacement problem.

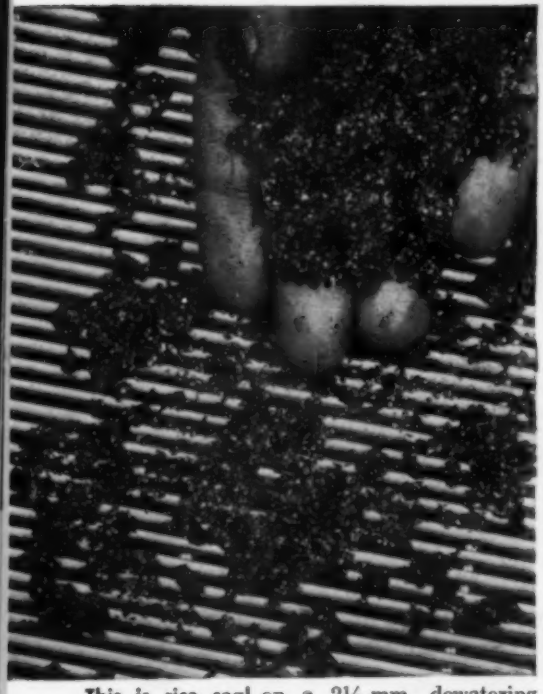
"We know of one case where carbon steel chutes were run alongside of Stainless Steel chutes in an actual durability test. *Seven* of the 10-gauge carbon steel chutes wore out and were replaced; but the 18-gauge Stainless Steel chutes were still in good condition.

"Stainless Steel chute liners, separation and dewatering screens are the greatest thing that ever happened to the coal cleaning business."

Buying new equipment? Start saving money *at the beginning* . . . specify service-tested USS Stainless Steel.



Here is #4 coal, the most difficult of all sizes to wash and dewater, as it comes down the Stainless Steel lined telegraphs. It was previously dewatered on Stainless Steel mesh shaker screens. The coal cleaning equipment was furnished by the Wilmot Engineering Company, Hazelton, Pa., who also designed the preparation plant.



This is rice coal on a 2½-mm. dewatering wedge bar. The smooth surface of Stainless Steel reduces friction, allowing coal to move faster with less breakage.

UNITED STATES STEEL CORPORATION, PITTSBURGH • AMERICAN STEEL & WIRE DIVISION, CLEVELAND
COLUMBIA-GENEVA STEEL DIVISION, SAN FRANCISCO • NATIONAL TUBE DIVISION, PITTSBURGH
TENNESSEE COAL & IRON DIVISION, FAIRFIELD, ALA.
UNITED STATES STEEL SUPPLY DIVISION, WAREHOUSE DISTRIBUTORS
UNITED STATES STEEL EXPORT COMPANY, NEW YORK

USS STAINLESS STEEL

SHEETS · STRIP · PLATES · BARS · BILLETS — USS — PIPE · TUBES · WIRE · SPECIAL SECTIONS

5-1620

UNITED STATES STEEL

You read about it in November Coal Age (Page 60) . . .

"New Ideas Pay Off at Trotter Coal"

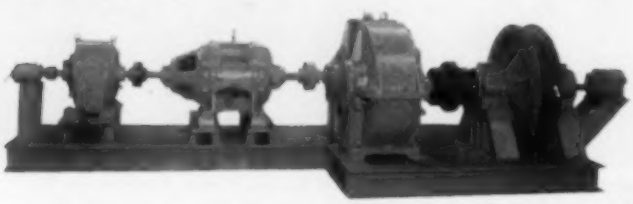
Connellsville Manufacturing & Mine Supply Company designers and builders of the cage, hoist, counterweights and guides of the Bunker Mine of the Trotter Coal Co., at Cassville, W. Va.

- Now prepared to furnish a packaged unit installed including complete electrical equipment, cage with escape doors, counterweights, hoist, guides, rope, landing buffers, head frame with hoist house, landing doors and housing, safety features and wired complete for push-button operation, lighting and telephone.

- Each installation designed to meet your particular requirements and conditions as to cage, size and shape, speeds and depth of shaft. The unit is simple in construction so that it can be moved easily and service maintained by mine personnel.

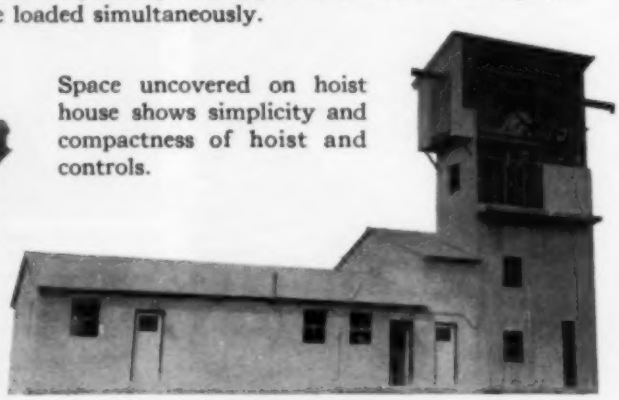
We can arrange for you to inspect present installation by appointment.

Underground landing area with cage in loading position. Steps and platform permit both decks of cage to be loaded simultaneously.



Friction-drive hoist and base with all parts mounted in position: Eddy-current brake, 75 HP Westinghouse motor, thruster brake, motor reducer, couplings, main hoist drum and governor.

Space uncovered on hoist house shows simplicity and compactness of hoist and controls.



CONNELLSVILLE MANUFACTURING & MINE SUPPLY CO.
CONNELLSVILLE, PENNSYLVANIA
SERVING THE MINING INDUSTRY SINCE 1901

Doesn't this make good sense?

When one firm, **FAIRMONT MACHINERY—**

- ★ *specializes in the design, building and erection of modern Coal Preparation Plants*
- ★ *has had almost 60 years experience in the cleaning plant field*
- ★ *gives you a wide choice of quality equipment*
- ★ *provides skilled pilot crews for the shakedown run of the new installation and to train your own operating personnel*
- ★ *guarantees a uniform product and better than 99% separating efficiency*
- ★ *has engineered and built many of the country's major coal cleaning plants*

★ *doesn't it make good sense that you should call a* **FAIRMONT** *engineer when you are planning to modernize an old or build a new Preparation Plant? Many satisfied operators have already done so,*

Now how about you?

FAIRMONT MACHINERY COMPANY
FAIRMONT, WEST VIRGINIA

DESIGNERS AND CONSTRUCTORS OF COMPLETE COAL PREPARATION PLANTS USING BOTH WET AND DRY CLEANING, CENTRIFUGAL AND THERMAL DRYING.

This Allis-Chalmers Crawler Tractor
MAKES A TIDY PROFIT
THEN LEAVES A TIDY LANDSCAPE

The marked trend toward land reclamation is placing more and more importance on the crawler tractor. For only the crawler tractor is flexible enough to pay its way through all stages of open pit operation.

Here, the Allis-Chalmers HD-16 proves to be a real efficiency expert as it demonstrates its usefulness both during *and after* an area has been worked.

Before production begins, the HD-16 strips and stockpiles overburden. If distance from pit to stockpile is too great for dozer operation, this versatile crawler teams up with a pull-type scraper for this initial job.

After the area has been worked out, the reclamation job begins. Overburden and waste, which have been stockpiled by the busy dozer, are now pushed into the pit and leveled off quickly. Reclaimed area can then be seeded for pasture, subdivided, or developed into some other form of usable land.

During mining operations, the HD-16 is always busy. It builds and maintains haul roads, feeds hoppers and conveyors, maintains stockpiles, skids heavy equipment, handles drainage problems, is ready and able wherever a push or pull is needed.

ALLIS-CHALMERS HD-16

your choice of two outstanding drives

	Horsepower	Weight
Torque Converter Drive	150 net engine	31,600 lb
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plus new, longer truck frames, long-life track, straddle-mounted final drive, easier servicing . . . many other outstanding features.

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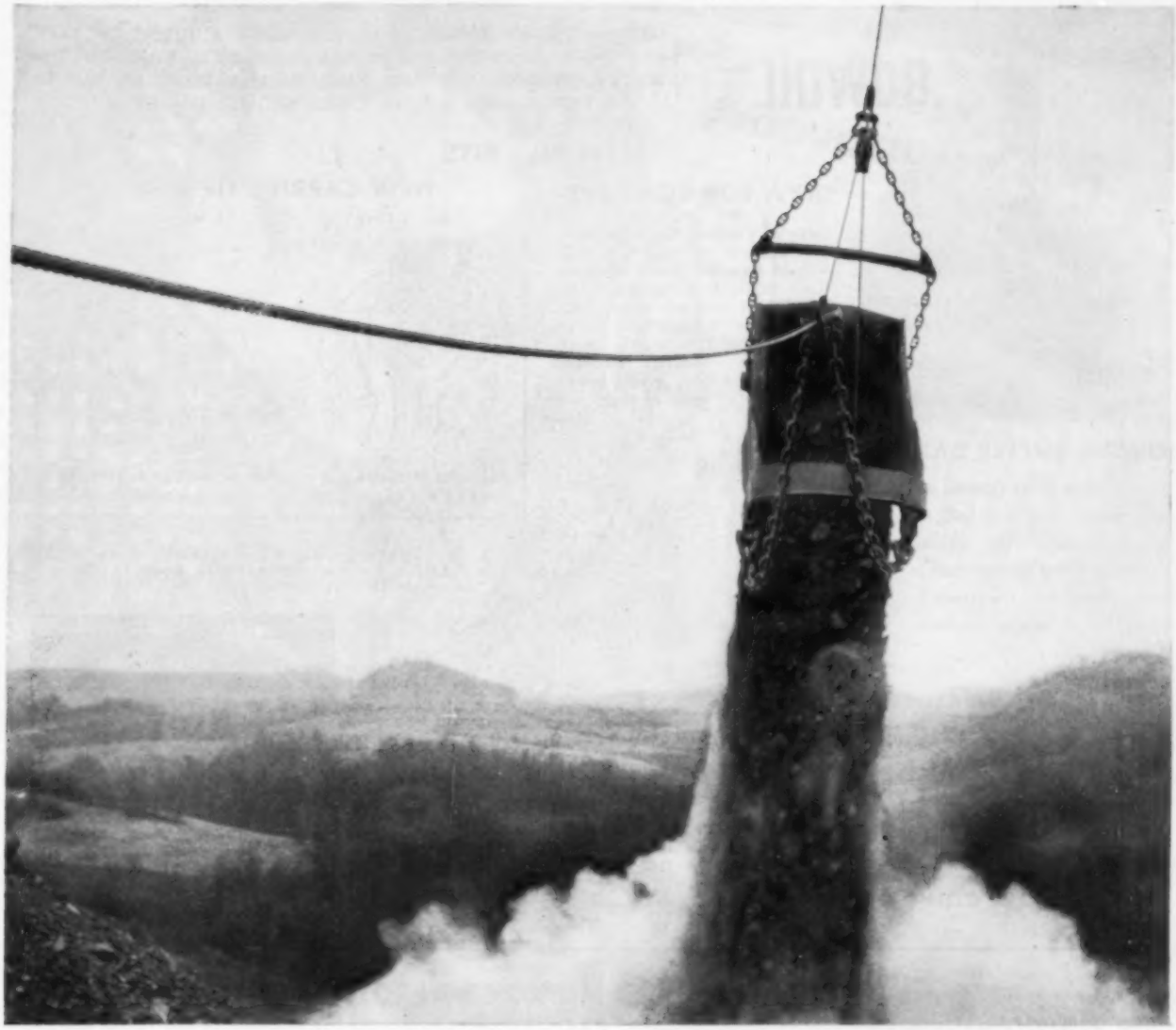

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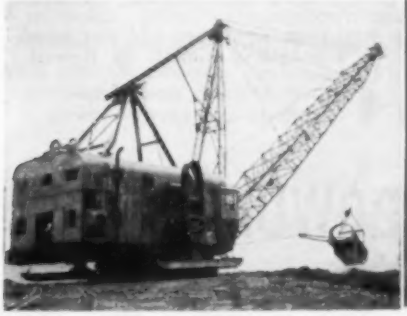

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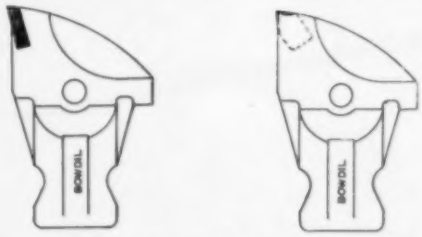

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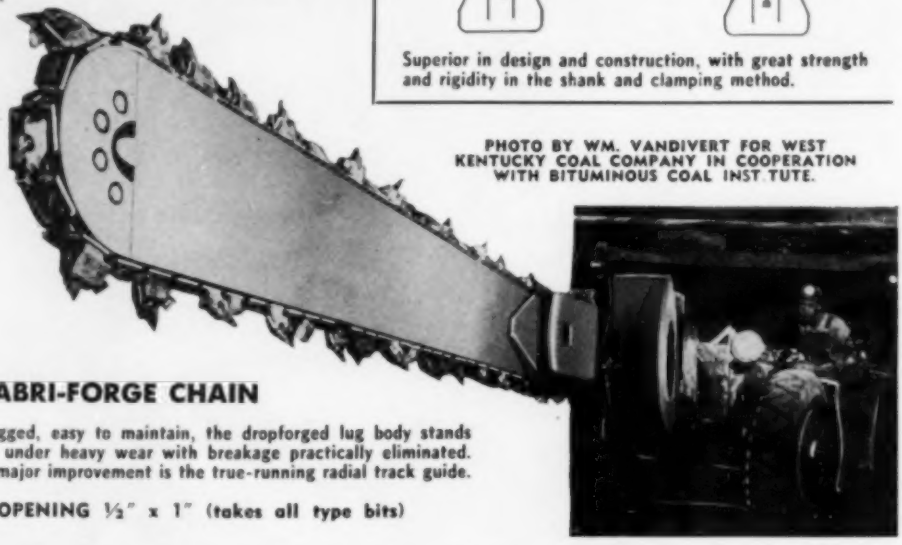

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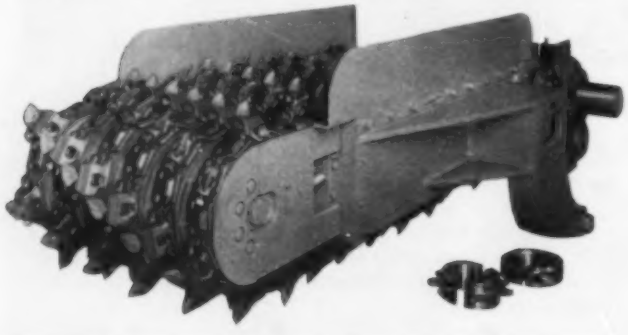

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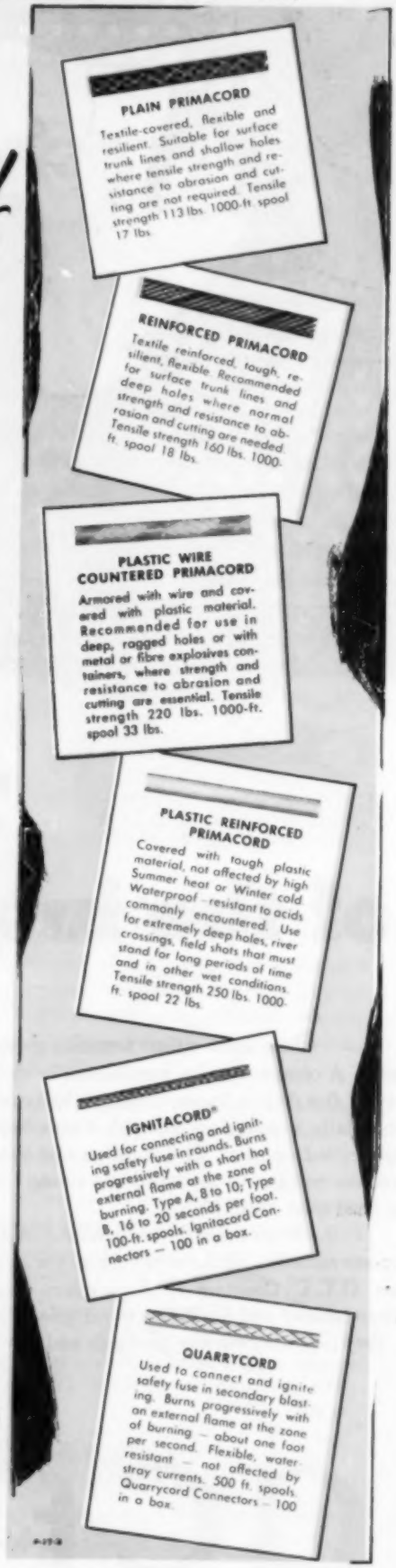
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Devoted to the Operating, Technical and Business Problems of the Coal-Mining Industry

Coal Age

DECEMBER, 1955

IVAN A. GIVEN, EDITOR

Perhaps Permanent

WHEN THE OVERSEAS EXPORT MARKET for United States coal began to bulge to its present size, there was considerable opinion that this bulge was only temporary, and that shipments would settle back to a much-smaller normal as soon as the foreign mines, particularly in Europe, got back into full production. But they didn't and it doesn't look like they will. Consequently, the European market begins to look like at least a semi-permanent thing for United States producers.

As in the United States, the Europeans will be using more and more energy in the future. If their own mines can't supply it, then coal must be sought elsewhere, or substitute Btu sources must be developed. Among the possible substitutes are oil and nuclear power, in which Europe is intensely interested. However, the time when they will become sharp competitors is not imminent, and a reasonable price for coal, plus reasonable land and ocean freights will postpone the day even further. Consequently, the United States can look forward to business equal to or better than that now being enjoyed (shipments now are at a rate of 45 million tons a year) for some years to come. And if it plays its cards right, it can stretch that period into the indefinite future.

Still Critical

WITH CONTINUOUS MINERS growing up to outputs of 1,000 tons or more per shift, the spotlight moves back even brighter on face transportation, the hardy perennial among mining problems. For a time it looked like an ultimate answer had been found in new-type conveying equipment and systems, including the extensible belt. But with averages of 1,000 tons per shift, this equipment is being extended to keep up. Maybe speeding up the conveyor will be the relatively simple answer, and maybe something entirely new will have to be developed. Anyhow coal will still have to live with its face-transportation problem, meaning that the man who can come up with the final answer will really be achieving something.

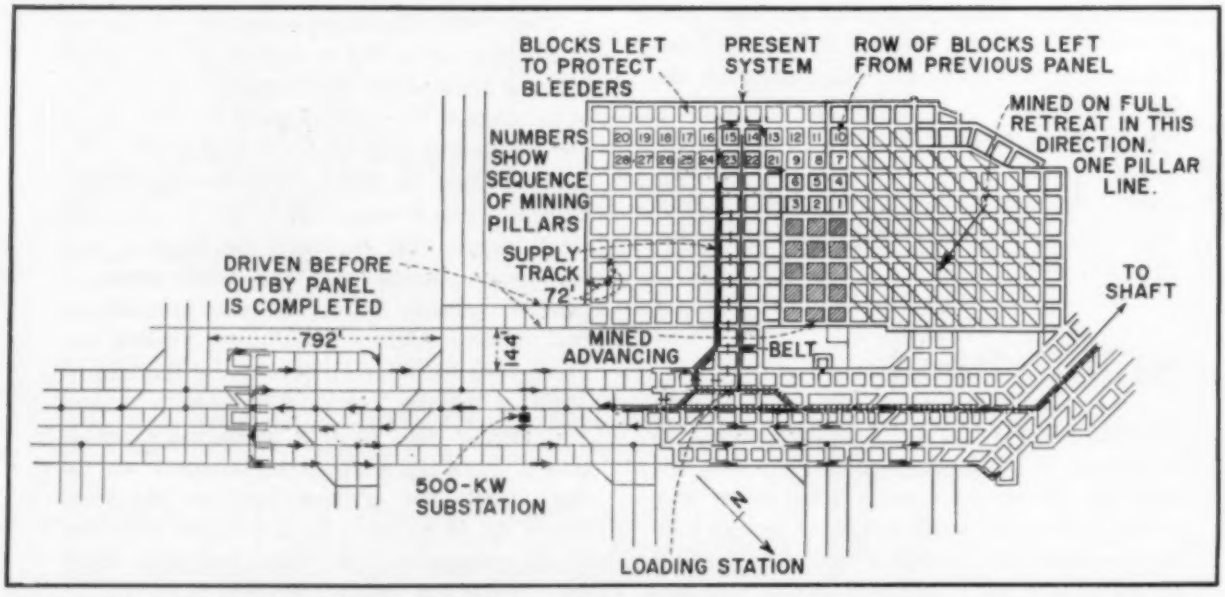
No Slackening

CAPITAL SPENDING by heavy industry is held by many economists, including the McGraw-Hill stable, to be the major ingredient in business boom and bust. Certainly the events of the past few years support their stand. On this basis, 1956 bids fair to be an outstanding year. Coal men, along with others, will welcome this news since it guarantees that the good business of 1955 will continue into 1956.

The 1956 capital-expenditures picture is briefly this, according to reports by American business firms to the McGraw-Hill Department of Economics. The total planned for new plants and equipment will be 13% higher than the $29.4 billion of 1955. The increase is the largest planned since 1951, when programs were stepped up to meet the Korean war emergency. Incidentally, the good news on general industry brings up the question of coal-industry plans. If, as many expect, demand rises to 600 million tons by the end of 1960, it will be necessary to provide around 110 million tons of new producing capacity, plus 135 million tons of replacement. At today's prices for modern facilities, the total looms up to as much as $2 billion or more. It is perhaps fair to point out that those who make the expenditure will reap the rewards.

CONTINUOUS MINER has increased productivity by 56.3% at Bell & Zoller's Buckhorn mine in southern Illinois. Units working in rooms and pillars are boosting coal recovery to 85% or better.

Boosting Mining Efficiency



CONTINUOUS MINING PLAN includes three-heading belt panels driven 90 deg with mains. Rooms on return-air side are driven on advance and pillars are recovered. Minimum of open territory is feature of system. Recovery is 85 to 90%.

Concentrated work and complete pillar extraction in areas laid out for continuous mining pays off in higher productivity at southern Illinois mine.

By A. E. FLOWERS
Associate Editor, COAL AGE

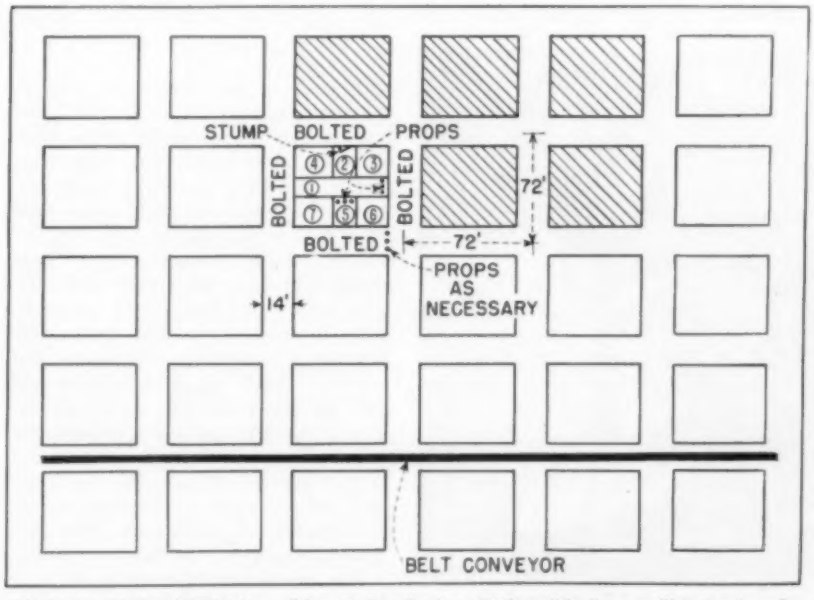
BETTER ROOF CONTROL, more tons per manshift and 85 to 90% recovery of coal in pillar extraction are top benefits from continuous mining at Bell & Zoller's Buckhorn mine, Johnston City, Ill. In the past several years, continuous miners have proved their ability to increase output both in development work and pillar extraction. As a result of the success of the experimental work all new development is projected for continuous mining, including complete pillar extraction in belt panels.

CONTINUOUS LOADING of 10-ton mine cars is achieved with reversible chain conveyor mounted at belt discharge. Spillage between cars is eliminated.

WHAT THE CONDITIONS ARE

Buckhorn mine taps the Illinois No. 6 seam about 3½ mi east of Johnston City, Ill. The coal, which lies nearly flat and averages 8½ ft thick, has a 1½- to 2-in parting about 1 ft above the bottom. This thin band does not hamper the continuous miners, but it does influence the placing of the kerf in the areas where conventional off-track equipment is used.

A soft fireclay underlies the coal but does not interfere with shuttle car travel. Drags on the shuttle cars keep the road leveled off and prevent ruts from forming. The roof usually is a soft gray shale but sometimes is black and includes nodules of pyrite. These nodules are very hard and make drilling for roof-bolting difficult. There are no massive sandstones in the 275 ft of cover over the coal and good falls are obtained in pillar work. Several major faults cross the property and to some extent define the mining limits. However, Buckhorn's newest development lies east of one of these faults and the large area is laid out for belt panels and continuous mining.



PILLAR RECOVERY is achieved by first splitting block parallel to breakthroughs, then removing remaining portions in sequence shown by numbers.

CONTINUOUS MINING DEVELOPMENT

Continuous miners were first used at Buckhorn to develop the East Main headings. Six headings, 14 ft wide on 60-ft centers, were driven with two Joy continuous miners according to a plan shown in the accompanying map. All breakthroughs were cut 90 deg with the headings, except those laid out as part of sidetracks at loading stations.

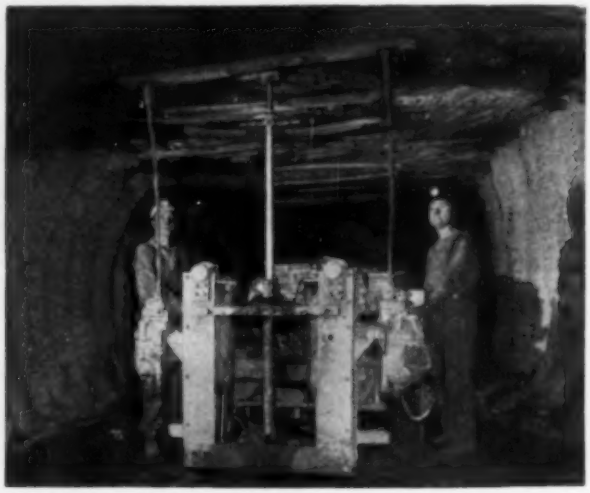
Each of the continuous miners advanced three headings, working in the face until it was advanced to its permissible limit. Breakthroughs then were cut 90 deg with the headings.

Two Joy shuttle cars are teamed

HAULAGE from continuous miner to belt is assigned to shuttle cars. Drag (arrow) between wheels smooths roadway.

MAIN HAULAGE EQUIPMENT includes 13- and 22-ton locomotives that pull 8-car trips to 225-ton bin at slope bottom.

BATTERY-POWERED utility truck delivers supplies to working area on working shift. Unit features rugged design.



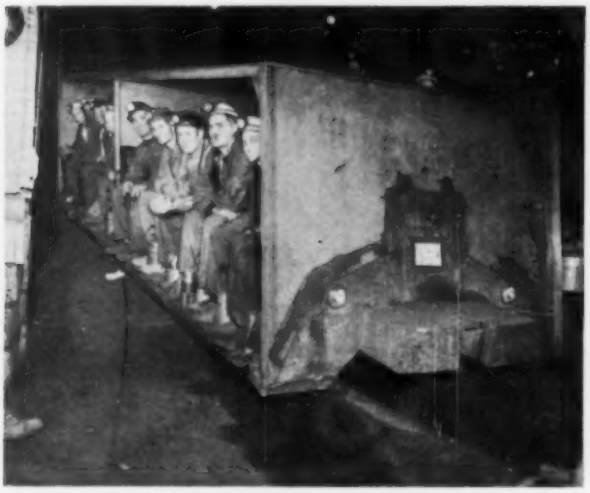
ROOF BOLTING for two miners is done with company designed rotary unit. Hydraulic jack supports 60-in plank.

ROOF COATING along main haulage roads on intake air has prevented weathering of roof and spalling. Material is sprayed on in layers 1/16 in thick.

with each of the continuous miners to carry coal directly to 10-ton dropbottom mine cars in main-entry work or to a 36-in Joy belt conveyor in panels. To keep hauls short in the main development, loading ramps were first moved ahead at 170-ft intervals. This distance was later changed to an average of about 220 ft.

In main-entry work, a 10-ton gathering locomotive handles 8-car trips between the loading station and the sidetrack. Cars are Sanford-Day and ACF dropbottom units. A 13-ton Jeffrey locomotive pulls the loaded cars to a 225-ton bin at the bottom of the slope. In panel work, where belts are used for gathering haulage, the mainline locomotive pulls trips from the loading station to the bin.

The initial development in the East Main entry provided territory for panel mining to the south. To speed



ALL-STEEL MAN CARS built in company shop carry men into mine and to working areas. Slope unit (left) is equipped with automatic magnetic brake that stops car if it overspeeds as men are being lowered to bottom of slope.

development of the first belt panel, one of the continuous miners drove three headings toward the panel limit while the other unit advanced a pair of bleeder headings around the outer edge of the panel. Thus a ventilating circuit in the area to be mined by the room and pillar method was assured.

EARLY PILLAR WORK

As the three headings were advanced a 36-in belt conveyor was extended in 200-ft sections in the middle heading. Thus shuttle car hauls were kept as short as possible. After the bleeders were completed on the west side of the headings and the headings were driven to their projected limit, the work was concentrated in driving rooms and recovering pillars on retreat on the west side of the panel. After a pillar line was established it was maintained for both sides of the panel. This meant that pillars on the left side were extracted in sequence from heading to face. When the working area became limited, one miner was transferred to start developing the next belt panel. Before mining was completed, two rooms were driven to the next panel to provide bleeder intakes to the mined area. When pillar work was completed, both continuous miners were moved to the mains to advance the six headings far enough to turn another panel. Then both machines were moved back into the partly driven belt panel. One unit was assigned to drive the three headings and the other to mine rooms and extract pillars advancing. A 144-ft barrier pillar was left between the mains and the first room of the panel.

PILLARING TODAY

Rooms now are driven 14 ft wide on 72-ft centers from the three-heading panel, with breakthroughs also on 72-ft centers. Three rooms are cut into the bleeders before the first pillar extraction is begun. The pillars are mined advancing but the first pillar of each room is left in to protect the heading.

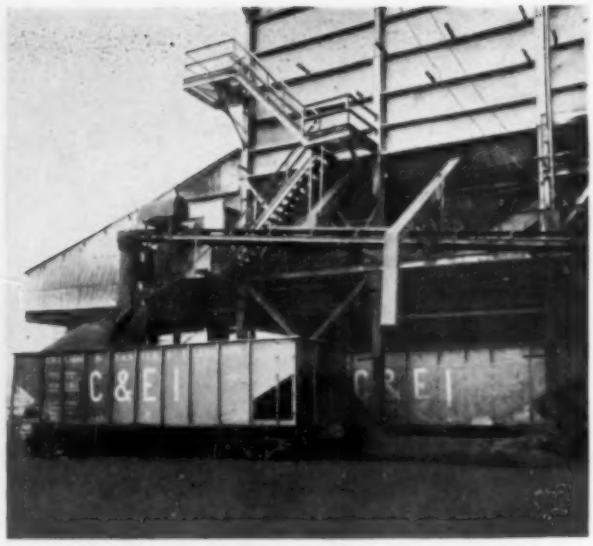
POWER for continuous mining sections is supplied by 500-kw rectifier located near working area. Wheel-mounted unit is easily moved to new location.

Two rooms always are kept open ahead of the advancing pillar line. Mining is concentrated in one pillar and the pillar is removed completely before mining is started on the next one. Further, all the pillars between a pair of rooms are recovered before the miner moves to a new room.

To keep the two rooms always open ahead of the advancing pillar line, mining is done as follows: After a row of blocks has been removed, the miner is moved ahead of the next inby room which was previously driven and a new room is cut through to the bleeders. Next, the miner is moved back to a previously driven room adjacent to the fall and a new row of blocks is mined. Thus mining alternates between rooms and pillars.

When the last row of blocks on the right side of the panel has been extracted, rooms are started on the left side and chain and room pillars are recovered on retreat. However, these pillars are mined in the opposite order from those on the right side. The chain pillar next to the last room pillar on the right is taken out first, then the next chain pillar, followed by the room pillars on the left. The last room pillar is left in to protect a bleeder along the edge of the caved area. After a row is completed on the left side, the miner is trammed back to the heading and another row is started. This keeps pillar mining moving in one direction and thereby eliminates a V in the

PREPARATION FACILITIES include two-stage jig washing, recovery of 28Mx0, thermal drying and flexibility.



RECOVERY BELT along lower side of storage bins adds flexibility in blending and loading to Buckhorn plant.

pillar line in the middle of the panel.

After the right side of the panel is mined completely, the air currents are changed and intake air is directed into all of the headings and a regulator is placed in the bleeder to control the flow there and to force part of the air over the caved area.

Each continuous mining crew includes a miner operator and helper and two shuttle-car operators. Common to both crews are the following: one mechanic, two roof bolters, one belt cleaner, one loading-point man, and one foreman.

Crews have been producing an average of 43 tons of clean coal per man shift, up 56.3% from conventional output. On a raw-coal basis with 18% reject, output figures out to be 52.4 tons per man. Output per manshift from conventional off-track units is 27.5 tons of clean coal.

Recognizing the production potential of continuous miners, Bell & Zoller plans to add more of them in the future. The first step in expanding continuous mining was the addition of a Goodman 400 boring type machine on Nov. 1. Aside from the increase in productivity, Bell & Zoller has had excellent results in pillar extraction. Recovery is now 85 to 90% compared to 45% in the areas where pillars are not recovered.

In addition to the continuous mining machines, there are four off-track units. Each is made up of a Joy 11-BU loader, 10-RU cutter with 9-ft bar, two shuttle cars, Dooley or Joy coal drill and a company-designed rotary roof-bolting machine where bolting is practiced. A 14-man crew, including the foreman, is assigned to each section.

Full-seam mining is practiced and coal is broken on shift with Airdox. Room panels with five headings are projected 900 ft deep and 18 rooms on 50-ft centers are driven 300 ft deep off both sides. An average of 11 working places, including five headings and six rooms on the return-air side, is maintained as the headings are advanced. On retreat, a maximum of six rooms are mined at a time. Pillars are not recovered. Panels are sealed after mining is completed and periodic inspections are made of all seals.

ROOF SUPPORT

The roof in the headings developed with continuous miners was supported by roof bolts installed as soon as possible after the coal was mined. Most of the time the rock was strong enough to permit a heading to be driven to the permissible limit before a breakthrough had to be cut. If the roof became weak or bad the machine was immediately removed and 5-ft expansion-type roof bolts with 6x6-in bearing plates were installed. However, the roof weathered badly when exposed to the intake air and spalled between the bolts. To provide more bearing surface and reduce spalling, a 60-in board was used with two bolts on 52-in centers as the standard support. The steel bearing plates are still used to hold the board firmly against the roof.

ROOF COATING

The comparatively soft shale roof weathers very rapidly when exposed to moisture-laden air and then spalls. In 1953 mine management made plans to reverse the direction of the air flow in the mine and direct the intake through the main haulage roads. To prevent the spalling of the roof that would take place when the moist air came in contact with it, mine management became interested in roof coating as a method of sealing off the air.

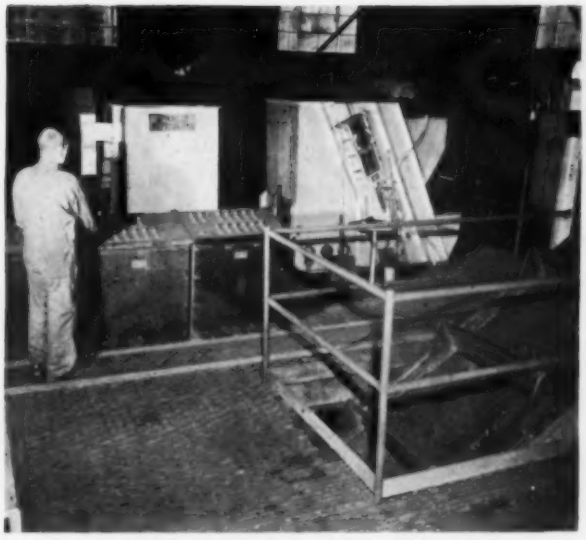
Before starting on a full-scale coating program, several trial applications were made of a material including an asbestos fiber and an oil thinner with a high flash point. Evaporation of the thinner was slow and therefore two layers of rock dust were sprayed on the coating to speed setting. Nearly all of the rock dust was absorbed by the coating and caused it to set to a rubber-like consistency.

The "Mine Seal" coating material was first pumped to the spray guns from a 54-gal steel drum but too much time was lost in changing the pump to a new drum. To eliminate this delay, two 800-gal tank cars were built and the material was pumped directly from these. Tanks are hauled by truck to Lawrenceville, Ill., where they are refilled by Emulsions, Inc., manufacturers of the coating material.

At the start of the coating program in the main haulage, management was concerned about whether the material would stick to roof which had been rock dusted. However, early experience showed that the air pressure from the nozzle blew enough dust from the roof to permit the material to stick.

To break down the viscous material at the nozzle, air pressure was maintained at not less than 100 psi. Equipment used for coating included the

MAGNETIC PULLEY removes tramp iron from raw coal as it is discharged from slope belt into preparation plant.



PUSHBUTTON CONTROLS for plant units are centrally located. One man operates controls.

two 800-gal tank cars, Binks pump, two spray nozzles and pole guns, air compressor and locomotive to move the tanks. The spraying equipment is very similar to that used to undercoat automobiles. Exclusive of the two tank cars, the spraying equipment cost about $500.

Three men made up the coating crew. Two men sprayed the roof and the top 6 to 12 in of coal while the third man operated the locomotive and did odd jobs. When these men became experienced they could coat up to 1,100 lineal ft of entry per shift, including as much of the breakthroughs as could be reached. Data on coating a typical area in Buckhorn mine are as follows:

Lineal ft of entry	3,486
Area coated, sq ft	41,605
Sq ft per gal of coating	27¾
Material cost per sq ft	$0.018
Labor cost per sq ft	0.004
Freight per sq ft	0.001
Total cost per sq ft	0.023

Some of the areas have been coated about 3 yr and management is well pleased with the results. There has been some minor chipping in places but on the whole the company feels that the coating has been effective.

CLEANING THE COAL

Raw coal is carried up the haulage slope and delivered to the cleaning plant by a 36-in belt conveyor. A magnetic pulley at the discharge end removes tramp iron before the coal drops into a rotary breaker with 7x9-in oval openings. The broken product flows to a flight conveyor to a McNally-Norton 5-cell jig making a primary separation at 1.55 specific gravity. Clean coal passes directly to the primary classifying screen and the middlings are reduced by an American ring crusher and rewashed in a secondary McNally-Norton 3-cell jig. Clean coal from the secondary unit joins the primary clean coal and flows to the primary classifying screen where it is separated into 6x1 and 1x0 fractions.

The 6x1 is separated into 6x4, 4x2, 2x1½ and 1½x1 sizes and loaded into railroad cars, or the three larger sizes may be crushed and rescreened on the secondary Allis-Chalmers Ripl-Flow vibrators. Products of the secondary screening are plus 1-in, 1x⅝, ⅝x¼ and ¼x0. The plus 1-in is recrushed in an American ring crusher and separated into plus 1-in, 1x¼ and ¼x0 sizes. The 1x¼ is delivered to the 1x⅝ storage bin, the ¼x0 is stored in the carbon bin and the plus 1-in is conveyed to the 1½x1 bin.

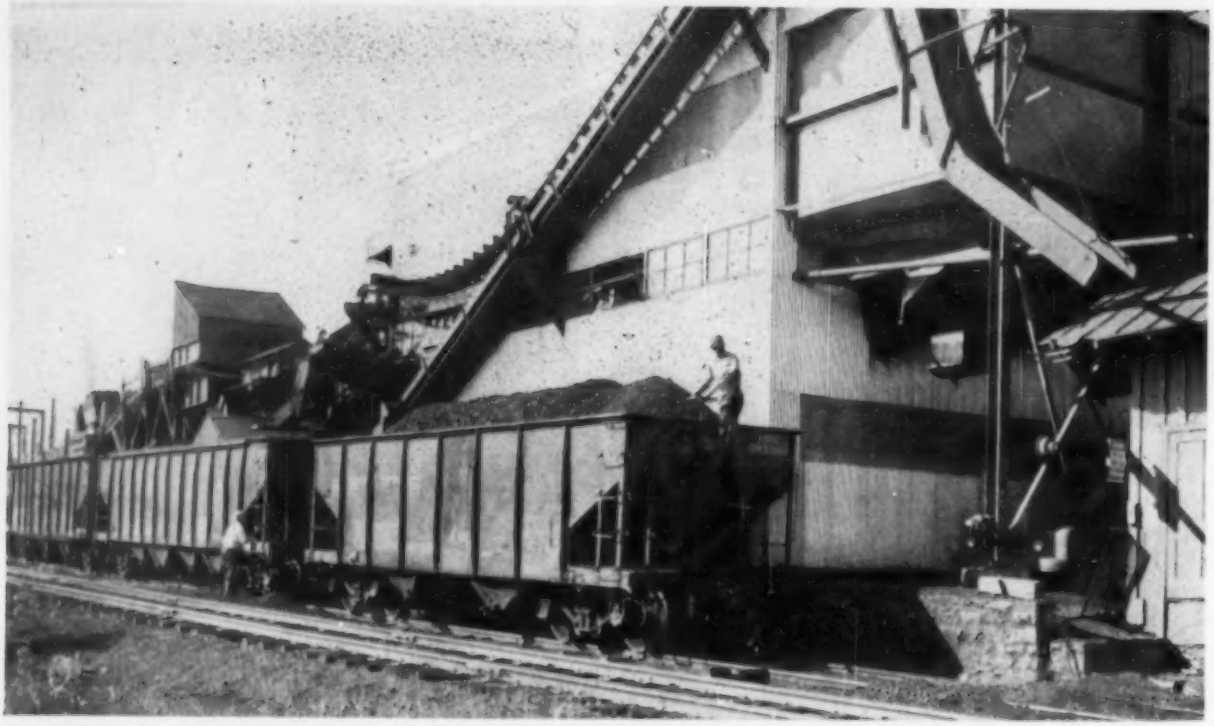
The 1x0 is sluiced to three dewatering screens and separated into 1x28M and 28Mx0 fractions. The bottom of the sluice and the dewatering screen are equipped with Bixby-Zimmer ½-mm stainless-steel screen cloth. Three McNally Vissac driers receive the 1x28M and complete the dewatering process before the coal flows to the rescreening section. Rescreened products are 1x⅝, ⅝x¼ and ¼x0 which are delivered to separate bins. From there they may be delivered separately to a recovery belt and loaded, or blended with other sizes before loading.

The 28Mx0 material is pumped to a settling cone from which concentrated slurry is pumped to a slurry tank where it is further concentrated for distribution to four Deister Concentrator SuperDuty tables. Clean coal is pumped to a battery of three Peterson cyclones operating in series. Underflow from the cones is dewatered on a 6x10-ft Peterson filter and then conveyed to railroad cars. Addition of this fine-coal recovery equipment resulted in the recovery of 300 tpd of material that had been pumped to the waste area. (*Coal Age*, Feb., 1954, p 108)

To smooth plant operation and permit flexibility in loading, a total of five storage bins are included in the main plant. The following sizes are stored in the bins: 2x1½, 1½x1, 1x⅝, ⅝x¼ and ¼x28M. Three screens under the bins containing the four larger sizes are used to remove undersize before the coal is delivered to railroad cars. Undersize flows to a degradation conveyor and is elevated to the fine-coal conveyor and loaded as carbon or screenings. The recovery belt which passes under the storage bins also adds to plant flexibility and permits easy blending of various sizes.

All grades of coal are dustproofed with 1,000-viscosity oil supplied by Standard of Indiana. A Brown Fayro spray system delivers 18 gpm of oil at 210 psi to the coal as it leaves the end of the booms. Retail stoker coal is treated in a company-designed rotary bin that tumbles the coal as the oil is sprayed into the bin.

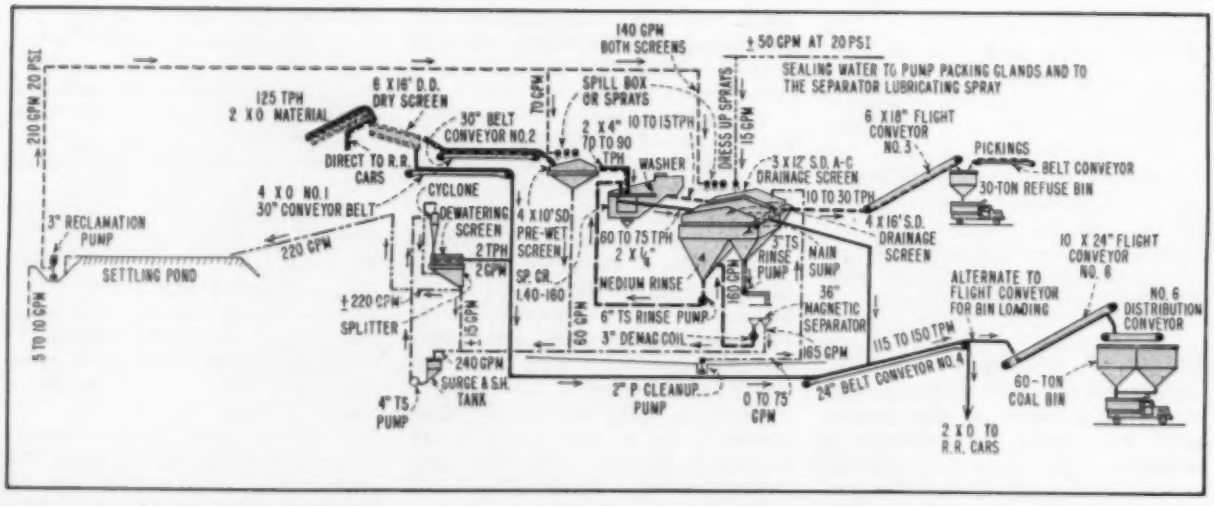
Buckhorn mine does a sizable business in retail coal. To assure truck customers an ample supply, four 90-ton storage bins are filled with retail coal.



BRADFORD COAL CO.'S new "coal refinery" features a simplified dense-media washing circuit in a 32x82-ft building for producing 1,000 tpd of Miller B seam coal. The 2x¼-in coal is washed and may be loaded with ¼x0 fines or separately.

Bigger Equipment: Step to

Bradford Coal Co. concentrates strip-mine production by using a higher capacity dragline. A new dense-media cleaning plant smoothes out variations in quality that may occur while "taking the coal as it comes."


140 GPM BOTH SCREENS
± 50 GPM AT 20 PSI
SEALING WATER TO PUMP PACKING GLANDS AND TO THE SEPARATOR LUBRICATING SPRAY
± 210 GPM 20 PSI
125 TPH 2 X 0 MATERIAL
6 X 16' D.D. DRY SCREEN
30" BELT CONVEYOR NO. 2
70 GPM
SPILL BOX OR SPRAYS
2 X 4" 10 TO 15 TPH
70 TO 90 TPH
WASHER
DRESS UP SPRAYS
15 GPM
6 X 18" FLIGHT CONVEYOR NO. 3
PICKINGS
BELT CONVEYOR
30-TON REFUSE BIN
3 X 12' S.D. A-C DRAINAGE SCREEN
10 TO 30 TPH
DIRECT TO R.R. CARS
4 X 0 NO. 1 30" CONVEYOR BELT
CYCLONE DEWATERING SCREEN
4 X 10' SD PRE-WET SCREEN
3" RECLAMATION PUMP
220 GPM
SETTLING POND
2 TPH
2 GPM
SP. GR. 1.40-1.60
60 TO 75 TPH 2 X ¼"
MEDIUM RINSE
3" TS RINSE PUMP
MAIN SUMP
4 X 16' S.D. DRAINAGE SCREEN
10 X 24" FLIGHT CONVEYOR NO. 6
ALTERNATE TO FLIGHT CONVEYOR FOR BIN LOADING
NO. 6 DISTRIBUTION CONVEYOR
5 TO 10 GPM
± 220 GPM
SPLITTER
15 GPM
60 GPM
6" TS RINSE PUMP
3" DEMAG COIL
36" MAGNETIC SEPARATOR
115 TO 150 TPH
1165 GPM
240 GPM SURGE & SH. TANK
4" TS PUMP
2" P CLEANUP PUMP
0 TO 75 GPM
24" BELT CONVEYOR NO. 4
60-TON COAL BIN
2 X 0 TO R.R. CARS

MINIMUM COAL HANDLING and cyclone recovery of fines from process water mean less degradation and higher yield. Single magnetic separator, demagnetizing coil and pair of sumps comprise medium recovery system.

HIGH CAPACITY STRIPPING EQUIPMENT, including a 12-cu yd dragline and rotary drill, permits economical recovery of 30-in seam under 70 ft of cover.

Higher Efficiency

A STEADY RATE OF GROWTH has characterized the operations of the Bradford Coal Co., Bigler, Pa., since its organization 15 yr ago by Ray S. Walker, a native of Bigler and now president and general manager of the sturdy central Pennsylvania concern. The growth is a measure of the ability of Bradword's staff to sense the trends of the industry and to work new ideas and equipment into the company's producing operations.

The latest example of this flexibility in response to changing needs and conditions is a switch to higher-capacity stripping equipment. This reflects a changing economic picture, including thicker cover, the tight price structure on the sales front and the hot competitive situation confronting central-Pennsylvania producers. The big unit now is a 12-cu yd Page dragline, recently placed in operation near Bigler by Penbrook Contracting Co., an affiliate of Bradford Coal.

But the big stripping unit introduced some complications. First, production is more highly concentrated, making it impossible to select alternate loading sites to compensate for changes in the quality of the coal in place. The coal must be taken as it is uncovered by the dragline.

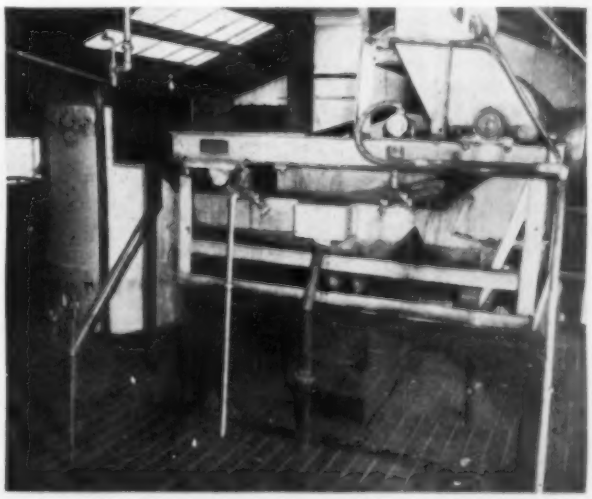
At the same time, one of Bradford's main selling points is consistency in quality. Therefore, to prevent a head-on collision with the new practice of taking the coal as it comes, the master plan included the construction of a washery, which went into operation before the big dragline went to work.

DENSE-MEDIA WASHING

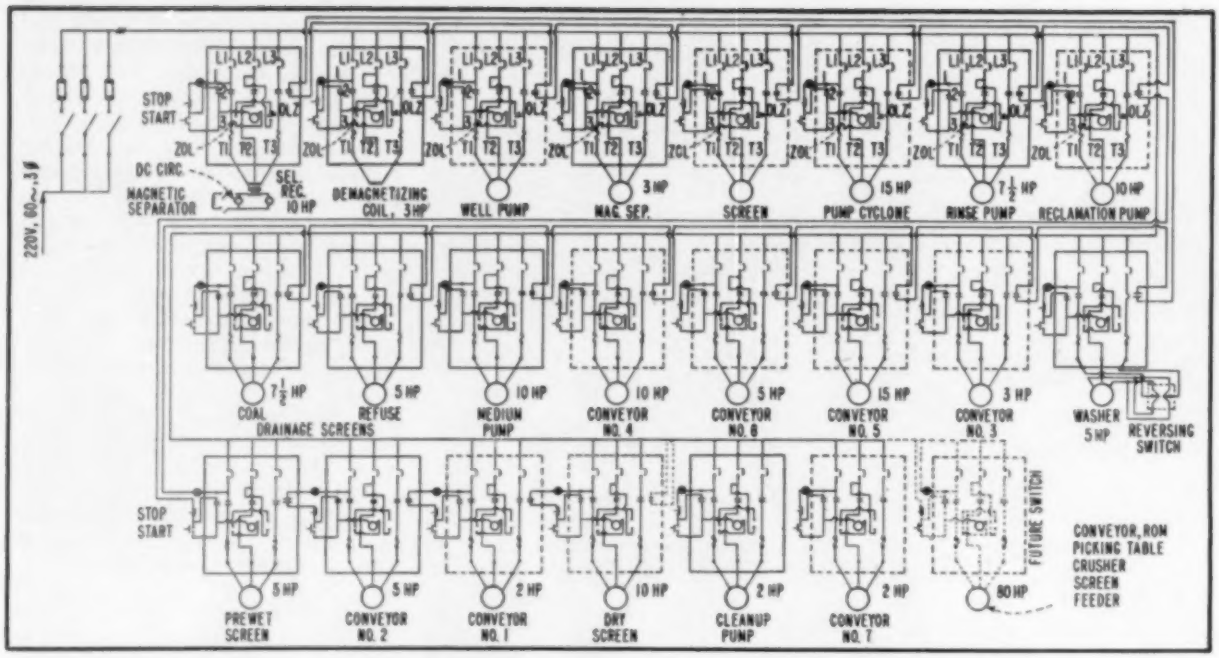
Bradford's modern plant, designed for one-man operation by the Daniels Co., Contractors, Inc., is equipped with a Daniels T-40 dense-media washer normally operating at 1.40 sp gr. First coal was put through in March, 1955, and the 12-yd Page stripper went to work in June.

Virtually the entire throughput is from the Miller B seam which is worked in thick cover by the new larger equipment and in thinner cover by contractors and Bradford using smaller units. The plant is located in the town of Bigler and is served

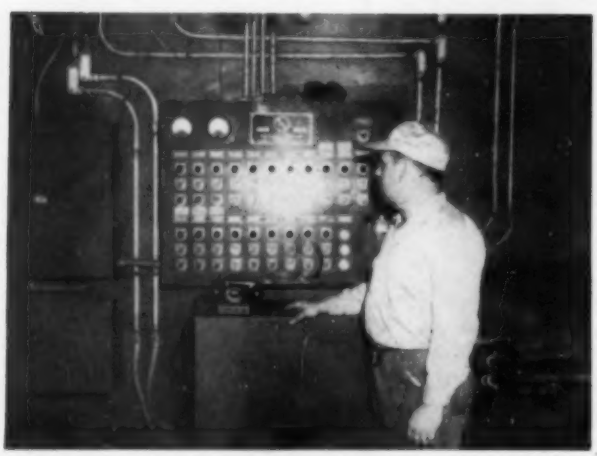
CLEAN COAL flows over discharge weir of dense-media vessel in direct line with discharge from pre-wet screen.



SINGLE 36-IN MAGNETIC SEPARATOR and demagnetizing coil are major units in stripped-down reclamation circuit.



ELECTRICAL INTERLOCKS on motor controls prevent spillage by stopping feeding units in sequence.



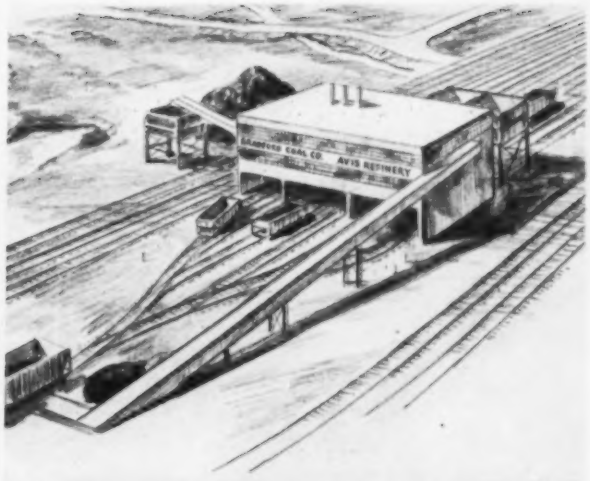
JOHN MORRIS, in charge of preparation, controls all plant machinery from this panel on operating floor.

OVERHEAD VIEW of operating floor shows pre-wet screen, in background, and clean-coal discharge of washer.

NEW PLANT-FEED FACILITIES, including railroad scale and scalehouse, will permit in-transit cleaning.

ROBERT CATCHER (left), analyst, and Russell Maxwell, coal inspector, check quality in modern laboratory.

M. K. WILLIAMS (left), and E. F. Green, plant erectors; H. J. Daniels, designer; R. S. Walker, Bradford owner-operator and growth sparkplug.



PROPOSED BRADFORD PLANT, to be erected at Avis, Pa., will perform total cleaning and heat drying of fines, and provide better service to users.

by the Pennsylvania R. R. Another larger plant on the New York Central, at Avis, Pa., is in the planning stages.

Core of the new plant, as noted, is a Daniels Dense-Media unit featuring a simplified medium-reclamation circuit consisting of a single 36-in Stearns magnetic separator, a 3-in demagnetizing coil, a pair of sumps under the clean-coal and refuse-dewatering screens, and a pair of recirculating pumps. Major advantages are lower investment as a result of the minimum number of auxiliaries in the reclamation circuit, and lower costs for equipment maintenance, plant operation and power.

At the time of the plant visit, the product being loaded was 2-in slack. The cleaning operation in this instance consisted of hand-picking the larger sizes, crushing to minus 2 in, then splitting the raw coal at ¼ in. The 2x¼ was fed to the dense-media washer and the minus ¼-in by-passed the washer and loaded directly. The washed coal may be loaded into the same car, or into another car, or stored in bins for truck sales or transshipment to a loading dock on the New York Central.

Rough screening, picking and crushing are done in an older tipple linked to the new "coal refinery" by a flight conveyor. In the new plant the conveyor discharges to a 6x16-ft Allis-Chalmers screen where the split at ¼ in is made. Plus ¼-in raw coal is elevated on a 30-in belt to a 4x10-ft Low-Head pre-wetting screen, then chuted into the Daniels unit.

RECOVERING MAGNETITE

Clean coal from the dense-media vessel is sluiced to a 4x16-ft Low-Head drainage screen. A portion of the chute to the screen is a launder designed to draw off most of the water, leaving enough to push the coal onto the screen. A Bixby-Zimmer wedge-bar insert, made of 3/16-in stainless steel bars with 1½-mm openings, covers the opening in the bottom of the chute.

On the drainage screen, fast-draining medium passes through into the medium sump (see flow diagram) to be returned immediately to the vessel. Sprays over the discharge half of the screen wash the remaining magnetite from the coal into a second sump which feeds the reclamation circuit. A parallel 3x12-ft screen provides for similar magnetite recovery from the refuse discharged by the bottom conveyor, the only moving part of the vessel.

Dilute medium is raised from the sump to the magnetic separator on the topmost plant level by a 3-in pump. Magnetite salvaged in the separator drops by gravity through the influence of the demagnetizing coil into the primary medium sump to be returned to the vessel.

Clean coal may be loaded directly or stored, as shown in the flowsheet, and washer refuse is dumped with picking-table reject into a 30-ton bin for disposal in trucks.

Maximum yield in clean coal is achieved by running the underflow of the pre-wet screen and the magnetic separator through a 14-in Heyl & Patterson cyclone. The thickened product of the cyclone is finally dewatered on a 30x72-in Syntron screen and loaded with the ¼x0 fines. Underflow from the Syntron unit is piped to a settling pond which overflows clarified water for the sprays over the pre-wet screen and the drainage screens.

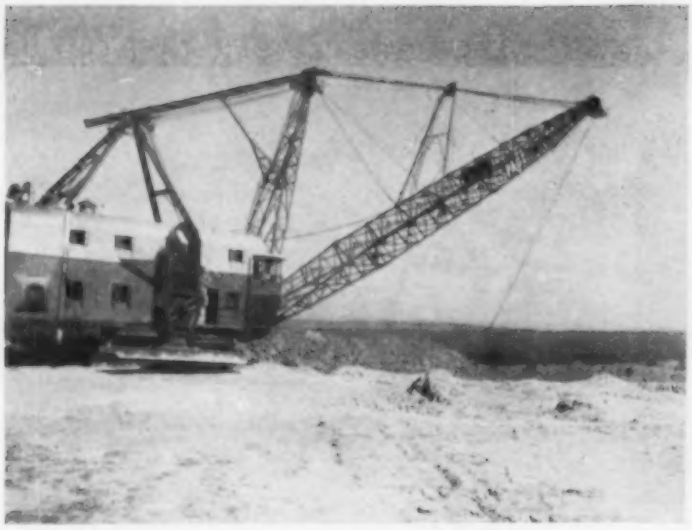
OPERATING SERVICES

Makeup water is raised to a 450-gal fresh-water tank on the top floor by a submersible pump in a deep well in the plant. This water is introduced through sprays and also serves to seal pump glands and feed the lubricating spray of the magnetic separator. The plant is washed down after each operating shift with water provided by a 2-in pump also installed on the pump floor at ground level.

Push-button controls for all plant motors are concentrated in a single panel on the operating floor. The design of the plant is such that John Morris, preparation superintendent, can oversee the entire operation with a minimum of traveling. Decks are constructed of expanded metal gratings and most of the units are open to view from the operating deck.

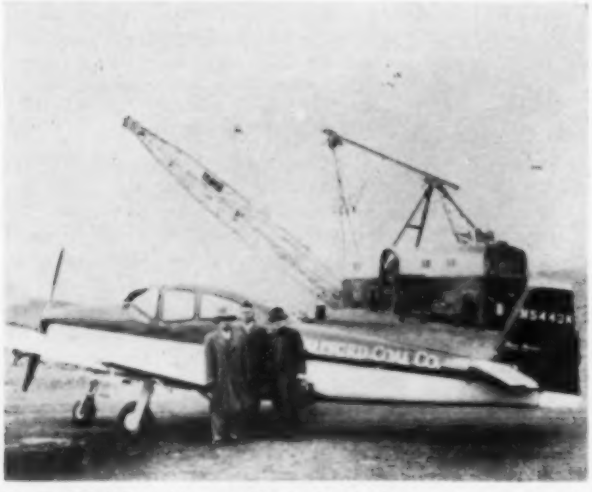
In designing the plant, Daniels engineers and Bradford officials included maximum window area to get full advantage of natural lighting, and in places where the use of glass is not practical the siding consists of translucent corrugated-plastic panels. The remainder of the plant is sheathed in corrugated galvanized steel. Williams & Green, Clearfield, Pa., erected the plant.

As shown in the accompanying schematic diagram, the plant units are electrically interlocked in coal-handling circuits where an outage of one unit might lead to a pileup from continued operation of a feeding unit.

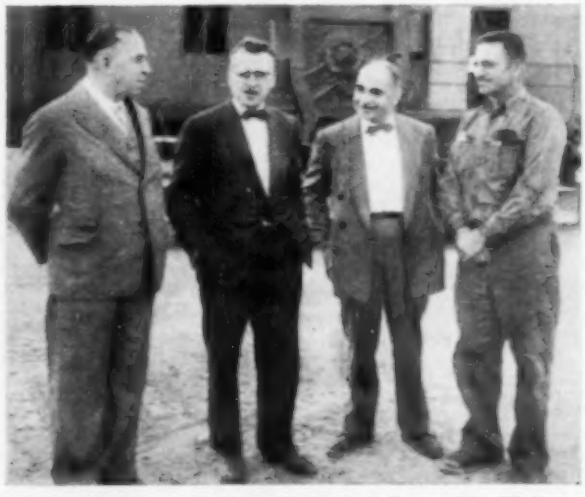


DIESEL-POWERED walking dragline concentrates production for increased efficiency while increasing reserves.

DRILLING 36-FT-DEEP VERTICAL HOLES without drill-rod changes permits operation of big drill by one man.



W. E. CRUM (left), president; S. E. Crum, vice president, Penbrook, and Mr. Walker, at Bradford's plane.



PIT VISITORS—J. F. Neill, Neill Coal Corp.; Mr. Walker; F. M. Leader, St. Regis Paper, George Benner, foreman.

At present the units in the rough-cleaning plant are powered by a single diesel engine, but electric drives soon will be installed.

The latest improvement, now under construction, is a new plant-feeding installation for handling both trucks and railroad cars. Originally all the coal was trucked into the plant. The new facilities include side-by-side 70-ton bins for trucks and in-transit railroad coal, a new Howe railroad scale and scalehouse and the required trackage. The run-of-mine conveyor will be extended to receive raw coal from a feeder under the bins. This arrangement will permit more of Bradford's coal, which is loaded into railroad cars at other company operations, to be washed, thus increasing the company's ability to bid for new markets.

Constant checks on the quality of the coal are made by Penn Central Analytical Laboratories, Bigler, another enterprise of Mr. Walker. The coal-analysis facilities of the laboratory are available to other producers. The advantage to Bradford Coal Co. in having the laboratory nearby is that results of proximate analyses are available within a matter of hours, providing better control in preparation.

Ash in the raw feed from the Miller B seam averages about 12%, with a maximum of about 15%. The preparation goal is to reduce the ash to minus 9% in the cars loaded with 2-in slack. In meeting this specification the washer must produce a 2x¼-in product at about 6 or 7% ash.

Plant production is currently about 1,000 tpd, clean coal. Primary uses are in power generation and in industrial burners. Not far behind are sales to truckers of domestic coal.

DEEP-COVER STRIPPING

The big stripping effort now is to recover the 30-in Miller B seam from under 1,500 acres of fairly constant 70-ft-thick cover. The area to be worked is the Albert airport property, situated some 4 mi from the new cleaning plant. Later, the airport will be restored to service.

Taking over where smaller units were forced off the job by the deeper cover, the 470-ton Page 726 walking dragline is expected to uncover about 13,000 tons of coal a month. The unit

6-YR OLD PLANTING on spoil banks shows healthy growth of selected trees. Bradford plants all spoil banks.

LAKES IN BACKFILLED PITS, when stocked with fish, provide recreational opportunities for local youngsters.

is equipped with a 150-ft boom swinging a 12-cu yd Page Automatic bucket. Two such buckets are alternated to permit a proper maintenance schedule to be kept. The dragline operates from a bench cleared on top of the highwall by a bulldozer.

Overburden preparation in many instances requires both vertical and horizontal drilling by an Ingersoll-Rand Quarrymaster on the highwall and a McCarthy drill in the pit. Normal practice is to drill the vertical holes 36 ft deep down through a hard sandstone layer in a 17x17-ft pattern. Holes in alternate rows are staggered. Better distribution of explosives in the tough shales underlying the sandstone is obtained by drilling horizontal holes just far enough above the coal to prevent shattering the seam. A 70-ft-wide cut of overburden requires three rows of vertical holes and 66-ft-deep horizontal holes, the latter on 20-ft centers along the highwall.

Penbrook stripping officials, headed by William Crum, president of the company, now are running tests on Akremite (see *Coal Age*, May, 1955, p 70) as an overburden explosive. The first Akremite shot, consuming 5 tons of the blasting agent in 50 vertical holes and 19 horizontal holes, indicated that the costs of overburden breaking may be reduced as much as one-third. Fragmentation appeared to be suitable for satisfactory operation of the dragline.

At a nearby pit in thinner cover a stripping contractor employs a Bucyrus 88-B dragline and a 1½-yd Koehring 605 loading shovel. Cover is about 35 ft thick, and at this depth the harder sandstone stratum shows up. In solving the problem of breaking this kind of overburden without resorting to the use of the big drill, Bradford's stripping experts worked out a system of shortening the center distance between the horizontal drillholes and angling alternate holes upward to approach the hard layer. Blasts in this pattern have been effective in snapping through the hard rock and breaking it into loadable size for the drag bucket.

On the airport job, a Lorain 80 shovel equipped with a 2-yd Esco coal-loading bucket picks up the coal after the top of the seam has been cleaned by a bulldozer or grader, whichever is available at the time. The haulage fleet includes 9½-ton Ford and 10-wheel 12-ton White trucks, operated by driver-owners under contracts with Bradford.

In all possible instances, recovery beyond the limiting highwall is increased by augering with a 30-in unit drilling holes up to 100 ft long, and by deep mining into the highwall using belt and chain conveyors. A description of the latter method appears in *Coal Age*, October, 1950, p 86. Briefly the method consists of employing the open pit as a main entry after the last cut of coal has been loaded out. Individual room panels are advanced and retreated back to the open cut. Portable truck-loading equipment, power-generating units and fan are moved along in the pit as new panels are worked.

SPOIL-AREA RECLAMATION

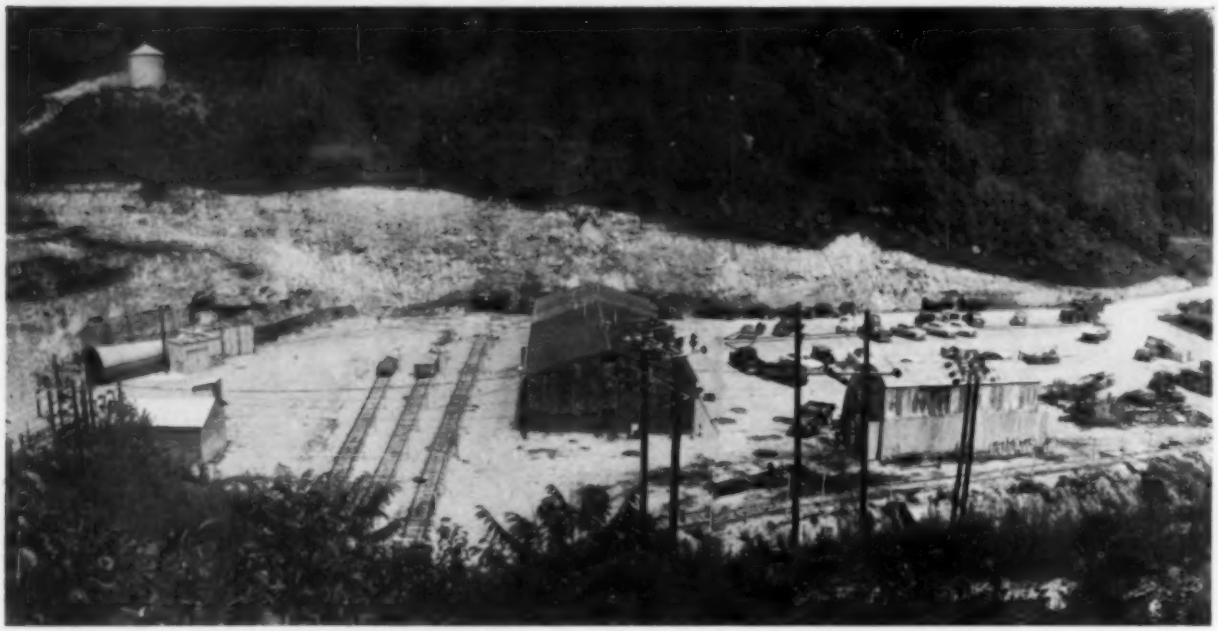
Spoil-area planting has been a regular element in the operating cycle since 1949. Since then a total of 615 acres have been planted in such hardwoods as sugar maple, black oak and aspen, and in red, white and scotch pine, and Norway and blue spruce. In 1950, the biggest planting year so far, 167,900 trees were planted on 143 acres. The seedling trees, which are purchased from state and private nurseries, are set out in a 6x6-ft pattern by seasonal crews. The earliest plantings show a growth of about 25 ft in some species.

Some fresh-water lakes that will sustain fish have been created in backfilled pits. Such valuable recreation areas are the result of careful sealing of the exposed coal with selected material from the spoil banks.

BRADFORD TOMORROW

Future plans for the growing company include the construction of a new "coal refinery" at Avis, Pa., as mentioned, which will feature a dual-gravity cleaning system for all of the feed, including the fines. It is planned to use the high-ash reject of the cleaning vessels as a source of heat for drying the washed fine coal. As shown in the accompanying sketch of the proposed plant, six loading tracks will be provided. The coal is to be cleaned in transit from the company's mines to customers on the New York Central and its links.

Other officials on Mr. Walker's staff include Allen G. Butler, chief engineer and pilot of the company's Navion airplane; W. S. Merrow, general superintendent; George Benner, strip-mine foreman for Penbrook Contracting Co., and Russell Maxwell, coal preparation manager. A. E. Long, general manager of southern operations, now is planning the opening and development of a new deep mine in Tennessee.



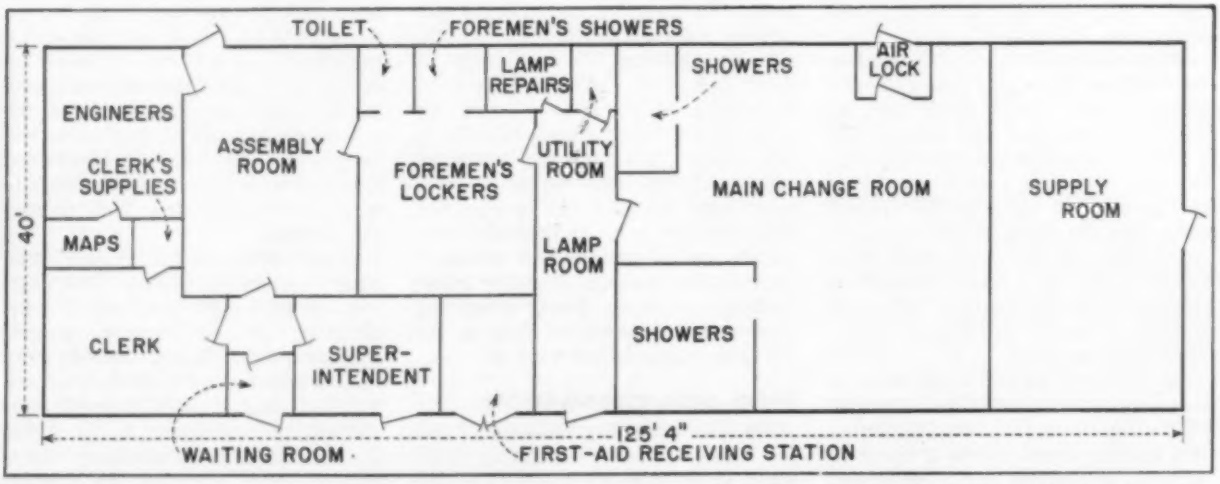
DESIGNED FOR EFFICIENCY AND LOW COST, new portal for Mine 214 cuts travel time 30 min, and distance from 4 mi to 1. The mantrip loads on the first track to the left of the administration building.

Economy Portal

- √ **Short life dictated minimum investment and maximum salvage value.**
- √ **Efficiency demanded adequate facilities for men and supervisors.**
- √ **Engineering research produced a design returning cost in two years.**

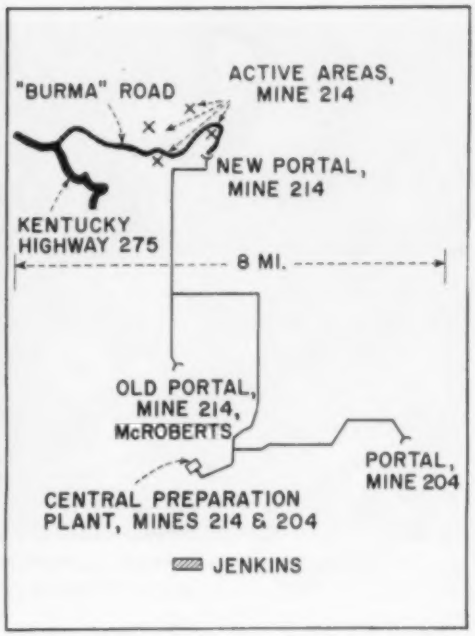
SUCCESSFUL SOLUTION of the problems involved in providing portal facilities for a mine with a remaining life of only 5 to 8 yr, and in an area not too favorable to low-cost construction, has resulted in an installation that will return the investment in the first 2 yr in reduced travel time. The mine in question is No. 214, Consolidation Coal Co. (Ky.), Div. of Pittsburgh Consolidation Coal Co. The mine location is Big Branch, Pike County, Ky.

The scope of the engineering and economic studies which preceded the



PREFABRICATED-STEEL ADMINISTRATION BUILDING contributed to low cost of new Mine 214 portal. Interior walls and ceilings also are of galvanized steel and are unpainted. Attic fan, gas heaters and insulation promote comfort.

PARKING AREA was made by spreading 12 to 18 in of mine rock and topping with 3 to 4 in of crushed limestone. Mine portal is at right.



NEW PORTAL cuts travel and provides conveniences and comfort not available at old.

successful solution of the problems involved in locating and building the new portal included construction of a mountain highway, as well as a portal design that would provide adequate facilities at minimum cost, and would permit considerable reclamation and possible re-installation at another mine.

TRAVEL CUT 30 MINUTES

When Consol of Ky. built its central preparation plant at Jenkins in 1942 the tipple at Mine 214, at McRoberts, was shut down and the coal was hauled 8 mi underground to the new plant. However, the portal for men and materials at McRoberts was continued in use. By 1952 the active sections had concentrated at the far side of the mine area about 4 mi from McRoberts. Travel time was an economic burden and the portal facilities at McRoberts were badly outdated.

Could a new portal near the working sections be built at a cost that would result in a certain benefit in spite of the short mine life? An outcropping of the seam (Elkhorn No. 3) in Big Branch Hollow, where two headings had been punched out for fan and substation installations, offered a location fairly close to the working sections. However, access would entail building an all-weather highway 4.4 mi long over a mountain gap. Elevation of the coal at the Big Branch opening is 1,400 ft, while the gap elevation is 2,080 ft. The portal site is a 10 mi drive from McRoberts, an 18 mi drive from Jenkins.

Studies proved the economic feasibility of the project and Big Branch Hollow was chosen as the location. Construction was handled by coal company men using the company's available excavating and grading equipment. Road construction was started Nov. 19, 1953, and completed April 4, 1954. The portal, with limited facilities, was put into use April 10, 1954, and there was a decided jump in tonnage beginning that day. Travel time was cut 30 min per shift. At present, travel averages 1 mi compared to 4 mi from the old portal at McRoberts.

BUILDING THE "BURMA ROAD"

While the entire cost of the highway was included in the cost that will be recovered in 2 yr, the road has other uses present and future. It provides access to the outside substations and fans, to company-owned timber land, and to proposed locations for a turbine mine pump and a future portal and airshaft. Because of grades and many curves, including a hairpin turn, the highway is locally termed the "Burma Road."

Minimum width is 16 ft. From Kentucky Highway 275 the course is up Rockhouse Creek on a 2% grade for 1 mi, uphill 1½ mi on an 8% grade, then downhill 1 mi on a 6% grade. In soft areas creek gravel and mine rock were distributed for a base. The road was covered with 1½x0 crushed limestone its entire length.

Drains installed across the road at 300- to 500-ft intervals were made from culvert and other pipe, mostly used, which the company had on hand. Cash outlay for road construction, including the rock surfacing, was approximately $60,000.

PREFAB CONSTRUCTION EMPLOYED

First cost, utility and reclamation value dictated Armco Steelox prefabricated construction for the administration building. Size of the building is 40x125 ft and it is divided into 11 principal rooms: assembly, clerk, superintendent, foremen's lockers, foremen's showers, first-aid, main change room, showers, engineers, lamp room and supply room. Ceiling panels also are Steelox and the ceilings and outside walls are insulated with 1½-in glass-fiber bats. This type of insulation was especially chosen because it is non-combustible.

The entire attic space is an exhaust air duct. Air entering through screened openings in the room ceilings is pulled out by a 3-ft Axial-Flow fan. Except for the supply room, the principal rooms in the building are lined with 20-gage Steelox wall panels. Doors also are of steel. Although not painted, the inside walls and partitions present a pleasing appearance. There will be no painting maintenance expense. Heating is handled by 16 gas-fired unit heaters supplied from a gas well on the coal company's property only 350 ft from the building.

START from Kentucky Highway 275 is by turnoff to the right marked by sign noting that the distance is 4½ mi and also that Consol of Ky. is the "Home of Famous Cavalier Coal." From the junction the road route is up Rockhouse Creek.

Burma Road Provides Portal Access

ENROUTE—Width of 16 ft is increased on curves. Road base is gravel and mine rock, crushed limestone topping.

DESTINATION—New Big Branch Portal, viewed from 600 ft above in mountain gap through which road was built.

Three rows of 8x8x16-in concrete blocks on a footer of concrete 9 in thick by 16 in wide comprise the building foundation. The floor was made by spreading and compacting 4 in of 1½x2-in crushed limestone, and then pouring a 4-in concrete slab reinforced with wire mesh. Grading for the building was started Nov. 2, 1953, and the building, with limited facilities, was ready for occupancy in September, 1954. The final touches were completed March 28, 1955. Cost of the completed building was approximately $47,000.

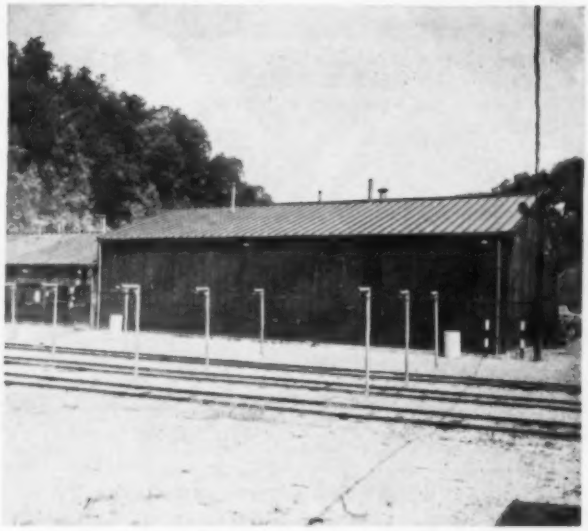
Other portal facilities and operations, comprising grading, surfacing, drainage, power supply, water supply, powder magazine, cap magazine and a 30x40-ft Quonset hut for a shop, cost approximately $34,000. Cost of moving a 10-yr-old 9-ft Jeffrey Aerodyne fan at the Big Branch Portal was not included.

The parking lot was covered with 12 to 18 in of mine rock and topped with 3 to 4 in of crushed limestone. Lines marking forward limits of the parking areas consist of used 60-lb rails held in place by metal stakes. The same size of scrap rail forms the curbing for a sidewalk of crushed stone alongside the administration building.

An 8-in well was drilled 280 ft deep near the administration building for a water supply. After chlorination, the water is stored in a 40,000 gal welded-steel tank on the hillside 92 ft above the yard level. Hot water is stored in the administration building in a 15,000-gal steel tank insulated with 3-in glass fiber.

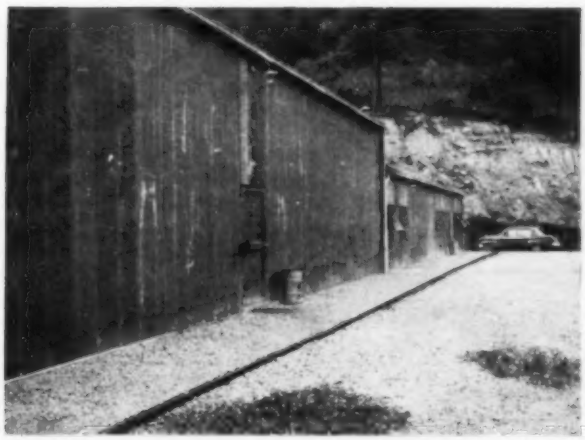
Number of men using the portal is 220 per 3-shift day. While the portal is without frills, such as a restaurant and commissary, it is comfortable and convenient for men and managers.

NO FRILLS was rule even in construction of actual portal. Trolley poles are of 3-in reclaimed pipe.



BUILDING OFFICES are in low section at left of building; bath house and supply room in high section.

Design Details Promote Utility at Low Cost



SIDEWALK along side of administration building has curb made of scrap 60-lb rail. Walk is crushed stone.

ASSEMBLY ROOM includes section foremen's report desk. Walls and ceiling are steel, except plywood (right) for maps.

CITATIONS AND AWARDS to Mine 214 are displayed in assembly room. M. E. Prunty, safety director, looks them over.

ACTIVE MINE SUPPLIES are kept in room at one end of administration building. B. V. Kegan, supply clerk, checks.

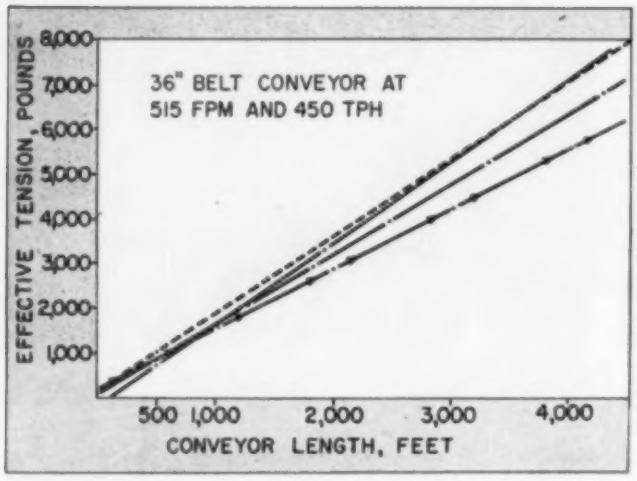


FIG. 1—CONSTANT SPEED AND CAPACITY

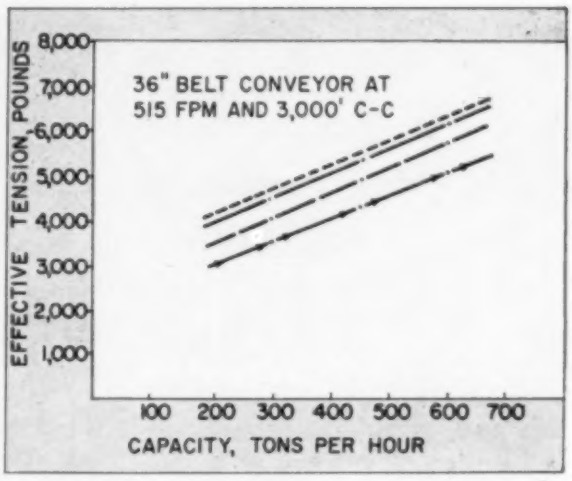


FIG. 2—CONSTANT SPEED AND LENGTH

Figuring Belt-Conveyor Horsepower . . . The Formulas of Four Manufacturers

More From Belt Conveyors

How to get a better match between horsepower and load, and how to get more service on the job, are results of field tests and laboratory research, which also shows that further investigation will bring added benefits.

By A. W. ASMAN
Head, Department of Mining, Pennsylvania State University

WIDESPREAD USE of belt conveyors attests to their efficiency in handling materials in and at mines and elsewhere. But even though belts have been used for many years, and even though the manufacturers have worked diligently to make them better, there are still unknowns and still need for improvements in design, construction and operation.

For these reasons, the Department of Mining at Pennsylvania State University has been conducting research on belt conveyors handling mined materials. The objectives have been the establishment of a more-accurate method of designing belt conveyors and better data on operation and maintenance. As a result of this project, sponsored by Hewitt-Robins, Inc., a new concept of horsepower-component determination, based on belt-tension differentials, has been developed. Also, the research has shown that certain installation and operating practices materially affect belt maintenance, and has pointed up the need for additional study along at least eight lines to achieve maximum efficiency in handling materials on belt conveyors.

DETERMINING HORSEPOWER

Basically, manufacturers of conveyor belting and machinery have been using the same horsepower formula. As more information became available from field installations, factors in the basic formula were modified. Practically all conveyors are designed today by adding together the horsepowers required to move the empty belt, move the load horizontally, and elevate the load. In determining the size of drive motor, the first two elements are relatively unimportant if the last is large. However, it is the combination of conveyor belting, machinery and drive, that determines the best design and insures trouble-free operation. Fig. 1 compares the horsepower formulas used by four of the belt conveyor manufacturers for variable length. Fig. 2 shows similar data for variable capacity.

Design is more than horsepower, however, and before a belt conveyor can be developed to meet operating requirements, it is necessary to have a clear grasp of certain operating principles. Among them are the following:

1. Energy requirements for the belt conveyor are expressed by the formula, horsepower equals speed multiplied by tension and divided by 33,000. Horsepower in this instance means drive-shaft input. Speed is linear belt speed in feet per minute, and tension is effective tension at drive pulley in pounds.

2. Belt speed is determined by drive-pulley center diameter and neutral axis of the belt at the drive pulley.

3. Effective tension is a measure of the dynamic force in pounds required to move the loaded conveyor.

4. Belt speed and tension both change gradually along the conveyor from the drive end to the tail, with speed at a minimum where tension is lowest.

5. Initial slack-side tension is required to prevent slipping between the drive-pulley surface and the belt.

The conveyor belt rides on troughing and return idlers which consume specific amounts of energy. This energy consumption is represented by so many pounds of tension imparted

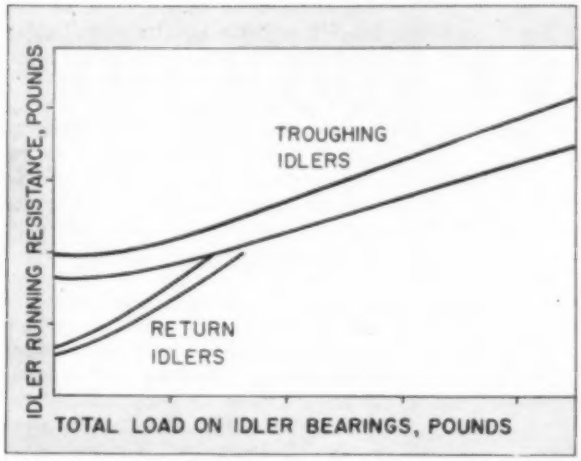


FIG. 3—DIFFERENT BEARING LOADS

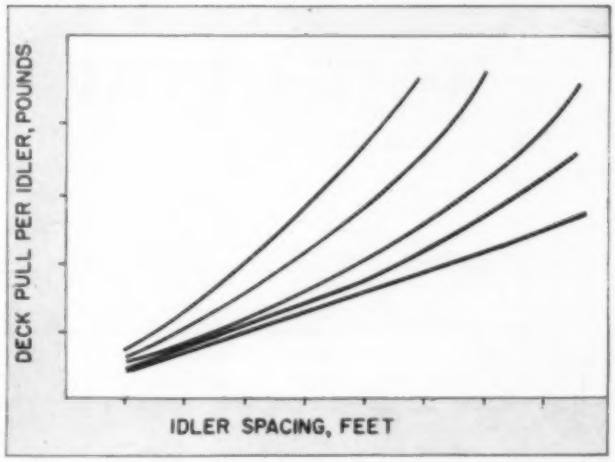


FIG. 4—VARIABLE IDLER SPACING

Force Required to Turn Belt-Conveyor Idlers Under Differing Conditions

by the drive motor. Friction losses in bearings increase slightly with rotational speed. Thus, for any conveyor, the power required to turn idlers is about the same per unit of length from head to tail.

In addition to turning the idler rolls, the effective tension is used to move the loaded and empty belts. For the usual installation, this accounts for more than 80% of the power requirements, practically all in the carrying strand. Where belt tension is highest, energy requirements for moving a loaded belt are at a minimum. This is evident when loaded belt action is observed at different locations from feed point to discharge. Where tension is low, the loaded belt deflects or sags more than where the tension is high. To a lesser degree, this same action takes place on the return strand. Thus, unlike the friction losses in the idlers, the power required to move the loaded belt is not constant per unit of conveyor length.

Design engineers have considered this nonlinear distribution of power requirements in a belt conveyor, at least on a qualitative basis. Modern high-tension conveyors are installed with variable idler spacings, distances being greater where tension is highest. It is significant that tons moved per hour per horsepower is high on these conveyors. Perhaps for other reasons, some handbook horsepower formulas use more favorable factors as length increases, and with it tension.

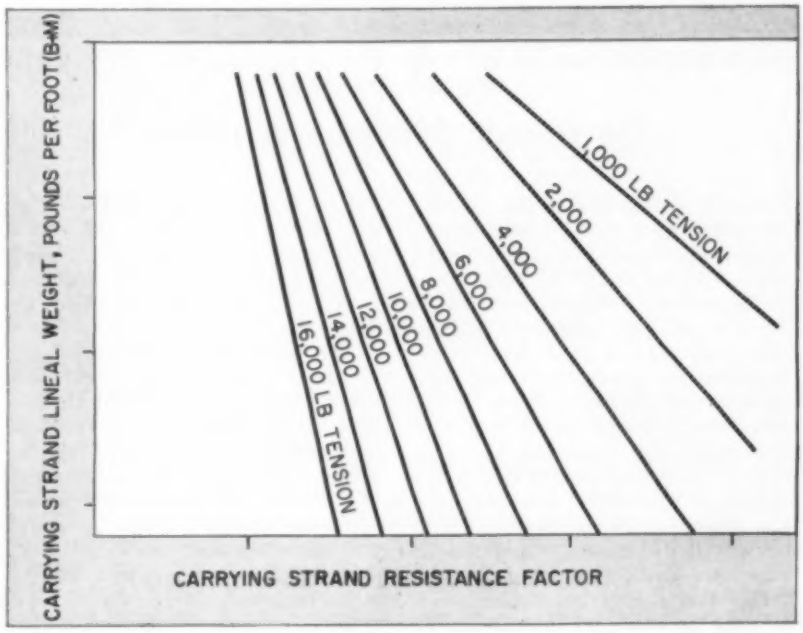


FIG. 5—VARYING CONVEYOR LOADS

BENEFITS OF GOOD DESIGN

Many operational and maintenance problems associated with belt conveyors would disappear if a more precise initial design were possible. However, some apparent design deficiencies develop after a belt has gone into operation. These may involve idler rolls and assemblies, belt alignment, and failures, drives, and takeup adjustments. For example, a 300-ft belt conveyor was installed 3 yr ago to convey coal horizontally. The foot shaft is adjustable by a screw takeup to maintain proper slack-side tension and thus insure drive-pulley operation. When installed originally, the drive motor pulled about 80% of full-load rating. The load increased, however, until some 6 mo ago the motor failed. When a larger motor was installed, the reducer failed. The answer is not poor design but failure to appreciate a fundamental of conveyor operation—the fact that total tension may come from the motor and takeup in varying amounts. When this conveyor was first installed the ratio was 4:1. At the time of initial failure it had increased to 6:1. Thus, as the conveyor belt became older and more pliable, it stretched but did not necessarily lose strength. None of the difficulties outlined would have occurred if slack-side tension at the takeup had been maintained.

One of the field belt conveyors studied in the course of the research program was successfully carrying 600 tph although designed for 450. No change was made from the original

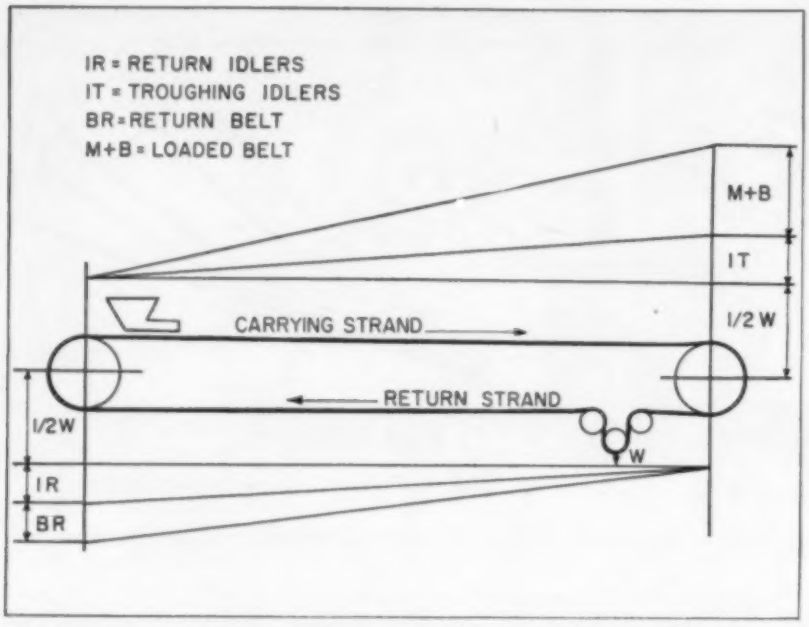


FIG. 6—DISTRIBUTION OF TENSION AROUND LOADED BELT CONVEYOR

The Overall Belt-Conveyor Picture

design to obtain this higher capacity but belt speed at the crown of the drive pulley was not considered in the original installation.

Because of the possibility of damaging idler-roll seals, greasing of another conveyor was not done periodically. If proper vents or fittings had been used, many bearing failures would have been avoided. At still another field installation, the grease fitting for a return idler was located less than 1 in from a structural column. Even if this fitting could be reached, it is obvious that greasing would not be adequate. These are only a few of the things that should be checked carefully by the operator before the manufacturer installs the belt conveyors.

LOGICAL CONVEYOR DESIGN

The logical method of designing a belt conveyor, or analyzing an existing installation for possible capacity increase, is by considering each component.

1. Friction losses in the rotating idler rolls are dependent on load, type of bearings, and to a small degree, speed. Fig. 3 indicates the relative turning force required for two styles of idlers.

2. Force required to move the return belt varies with tension, type of belt and idler spacing. Fig. 4 is developed from laboratory data and indicates magnitude of empty belt losses.

3. Carrying strand resistance is influenced by tension, belt-load section, idler spacing and tilt. Fig. 5 shows isotension lines for variable load sections as determined from field test data.

The sum of these three components, expressed in pounds, is a measure of the effective tension required. On relatively short conveyors, or units with high-tension bend pulleys, the terminal losses must be added. Also, changes in belt slope affect tension and must be added or subtracted.

It is obvious that knowledge of tension at all locations in a belt conveyor is imperative if an accurate analysis is to be completed. Unfortunately tension cannot be measured directly at more than one location. However, a reasonably accurate determination is possible by correlation with belt sag or deflection. If the belt acted as a suspended cable, the parabolic formula could be used directly. Since carcass construction causes the belt to act somewhat as an indeterminate structure, actual is less than calculated sag by a certain per cent. For the most common type of belt conveyor, the actual sag of the return strand is about 10% less than calculated. This relationship can be used to estimate belt tension.

Fig. 6 shows graphically the relative changes in belt tension around a belt conveyor. The counterweighted takeup is located at the conveyor discharge and accounts for slack-side tension and tension in the return strand. Moving with the belt travel along the return strand, tension increases from the takeup bend pulley to the tail. The belt at this tension, plus a small amount due to terminal friction, is carried around the tail pulley. At the feeding point, the tension begins to increase rapidly because of the power required to move the loaded belt over the troughing idlers.

Although shown as a straight line, the rate of tension change gradually becomes less in the direction of belt travel. Belt tension is at a maximum at the conveyor discharge and is equal to the effective output to the drive shaft plus slack-side tension provided by the counterweight. A clear understanding of these principles of tension distribution is essential to belt-conveyor design and operation.

MORE ANSWERS NEEDED

Although the results of this research project have provided a more substantial basis for belt-conveyor design, successful application is dependent upon the judgment of the analyst. It must be decided if a certain spacing, idler roll, or belt construction is best for the conditions expected. Not only is initial design important, but operating conveyors must be analyzed before changes are contemplated. Aside from this, further study still is required in many areas if the handling of mined materials with belt conveyors is to improve.

1. Starting of conveyors is a major problem and a study of drives is necessary for a satisfactory solution.

2. Material transfer and feeding should be studied to improve load section, belt wear and power loss.

3. Vertical curves at slope changes are arcs of circles, whereas the parabolic or catenary curve may result in better operation.

4. Decline conveyors, because of functional peculiarities, seldom operate as originally designed, causing much delay time.

5. The actual effect of terminal friction is unknown, preventing an efficient conveyor design.

6. Mechanical power transmission losses in belt-conveyor drive systems are important and should be studied.

7. Little is known about the effect of material size, moisture and type of mined material on load turbulence.

8. Belt conveyors, like other materials handling devices, pass through a change-of-efficiency phase, expressed in tons per hour per horsepower, which can be determined.

The Coal Commentator

Worth Studying

The flat pillar line may be as old as pillar mining, but it is only in the past 10 yr or so that it has begun to show up in many mining projections. Advantages of the flat or nearly flat line include a sharp reduction in or practically complete elimination of weight on projecting points, thus alleviating one major headache in pillar extraction. Now, the special characteristics of continuous machines, and of certain new forms of transportation behind such machines, are making flat lines much more attractive. In fact, it might be said that the industry is now past the stage of acceptance and is in the stage of refinement. One flat-line plan, as an example, has been set up to eliminate all but a minimum of the deadheading formerly necessary, while another of the half-advance half-retreat type has been arranged to take full advantage of working against the solid where the top is weak.

Since the emphasis is more and more on maximum recovery, intensified study of pillaring methods can pay off in safer, lower-cost production.

Raffa

Otherwise known as the Reserve Forces Act of 1955, "Raffa," as the boys serving under its provisions have nicknamed it, is being promoted as a new and promising method of building up a trained reserve for future use if necessary, while at the same time giving each citizen as much freedom of choice as possible in method and time of service. Basically, the new act imposes a 6-yr tour of military duty on all men up to age 26, made up of 2 to 5 yr of active service, 3 to 0 yr of ready reserve (part-time training), and 1 yr of standby reserve, subject to certain modifications and exceptions, one being only 6 mo of active training for men with critical skills. However, young men between 17 and 18½, with deferment up to 20 if doing well in high school, may enlist for a draft-deferred 8-yr duty made up of 6 mo of active army service and 7½ yr in ready reserve (48 2-hr class periods and 2 wk of field training a year). Youthful odds-figurers count this a good bet.

Aside from its vital bearing on security, Raffa is of immediate interest not only to young men of military age but to employers and parents as well. For full details, inquire at the postoffice for the address of the nearest Army Reserve Unit Advisor.

Good Two Ways

As has previously been mentioned here, one of the publications your commentator scans with interest and sometimes profit is *France Actuelle*. Among other things, the issue of Nov. 1 says "Fill your cellars with '55." It goes on as follows:

"For millions of Frenchmen on the growing side, and for many more millions of consumers, the grand news is that this is going to be a fine year for wines. A splendid sunny summer and a warm autumn, with just enough rain, have produced an excellent wine harvest in all the famous regions of the world's best vineyard country." Which maybe should lead one to inquire about the weather, the character of the corn crop and the quality of the branch water back up the hollers in the good old U. S. of A. Anyhow, this gives France in 1955 at least two distinctions, the second one being that its coal industry came the closest of any in Europe to meeting its country's needs. And even if France finds it necessary to increase its coal imports from the United States, a good wine could be possibly as acceptable as coin of the realm in exchange.

Not Far Away

In another year or so, Union Carbide & Carbon can "run up the flag" on its coal-hydrogenation process. This was the word from Dr. Joseph G. Davidson, Carbide vice president, in an address last month before the Society of Chemical Industry. Terming the development period a "long and bitter one," Dr. Davidson noted that total expenditure to date has been close to $32 million. Among other things, "we have had to revamp and modify our experimental plant that cost over $11 million, but we think we are now very close to an economical solution of the problem." Dr. Davidson's report indicates that commercial use of his company's process is not far away.

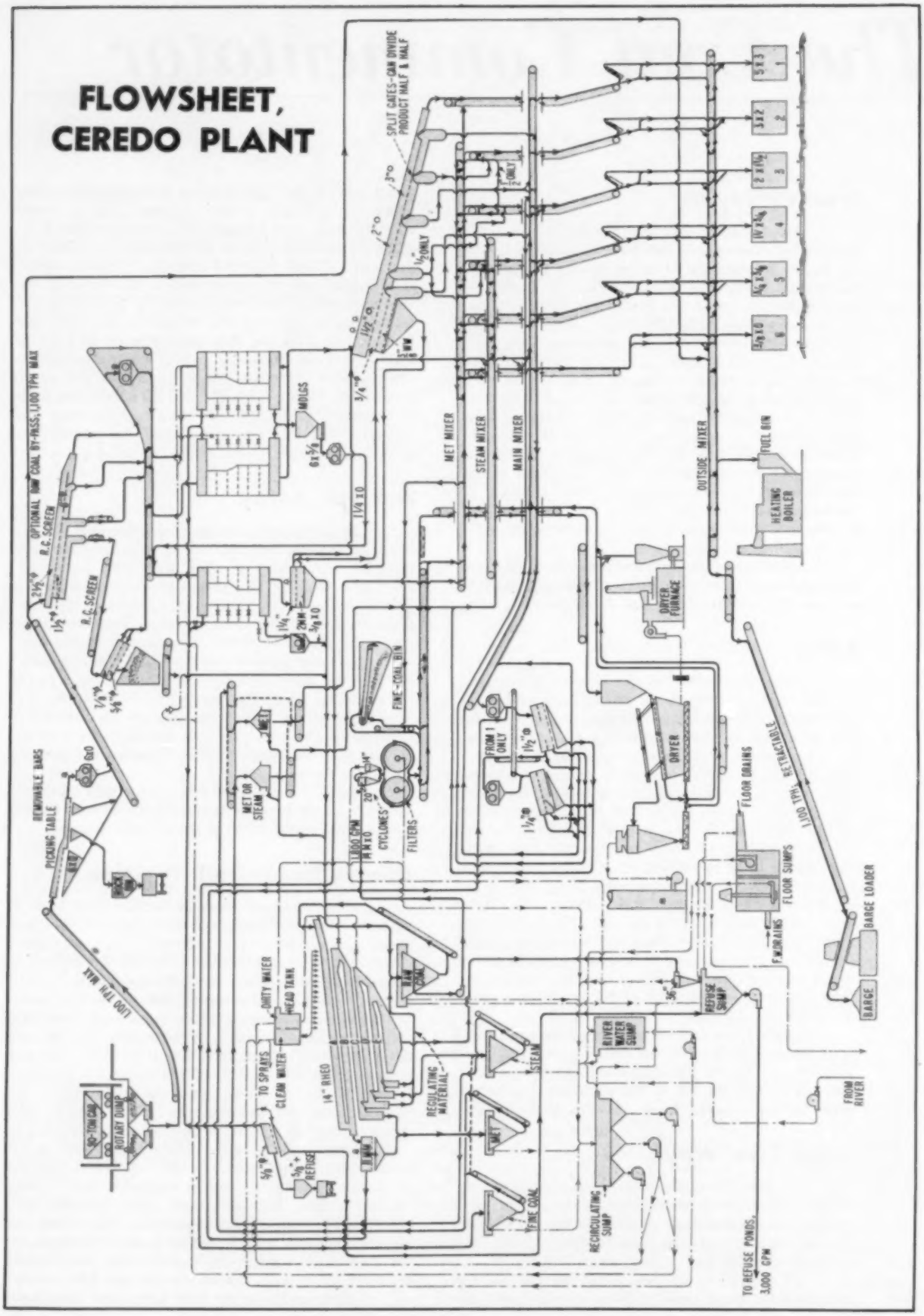
Look for the beginnings of a new chemical industry based on coal in the relatively near future, and a rapid acceleration in growth once started.

Sports Note—Golf Division

The lumber division of the Elk River Coal & Lumber Co., producing coal at Widen, W. Va., provides this account of a unique hole-in-one. Here, according to Mac MacIntyre, in Elk River Coal & Lumber's *Widen News*, is what happened:

"Speaking of unusual things in the sports world, there's the story about something that happened to Slim Currence, of Swandale, on the golf links at Hawk's Nest the other day. Slim, who has charge of the Elk River Coal & Lumber Co.'s lumber operation at Swandale, was standing on the tee minding his own business. As he prepared to take his shot, he felt a sting on his thigh and thought he had been hit by a golf ball. He and his caddie looked all around, however, and could find no trace of a ball. Finally, the caddie suggested that he look in his pocket. Slim did. And there was the ball, which had been driven, somewhat off course, by another golfer some 150 yd away. A hole-in-one, to be sure, but Slim would just as soon they would aim for the cup in the future and not his pocket."

Can anybody top this? Let's hear from you.


FLOWSHEET,
CEREDO PLANT
SPLIT CAKES—CAN DIVIDE PRODUCT HALF & HALF
OPTIONAL RAW COAL BY-PASS, 1,000 TPH MAX
R.C. SCREEN
MOLDS
WET MIXER
STEAM MIXER
MAIN MIXER
OUTSIDE MIXER
FUEL BIN
HEATING BOILER
DRYER FURNACE
DRYER
FINE-COAL BIN
CYCLONES
FILTERS
REMOVABLE BARS
PICKING TABLE
1100 TPH MAX
1,100 TPH RETRACTABLE
FLOOR DRAINS
FLOOR SUMPS
BARGE LOADER
BARGE
REFUSE SUMP
RIVER WATER SUMP
FROM RIVER
DIRTY WATER
HEAD TANK
TO SPRAYS
CLEAN WATER
14" RHEO
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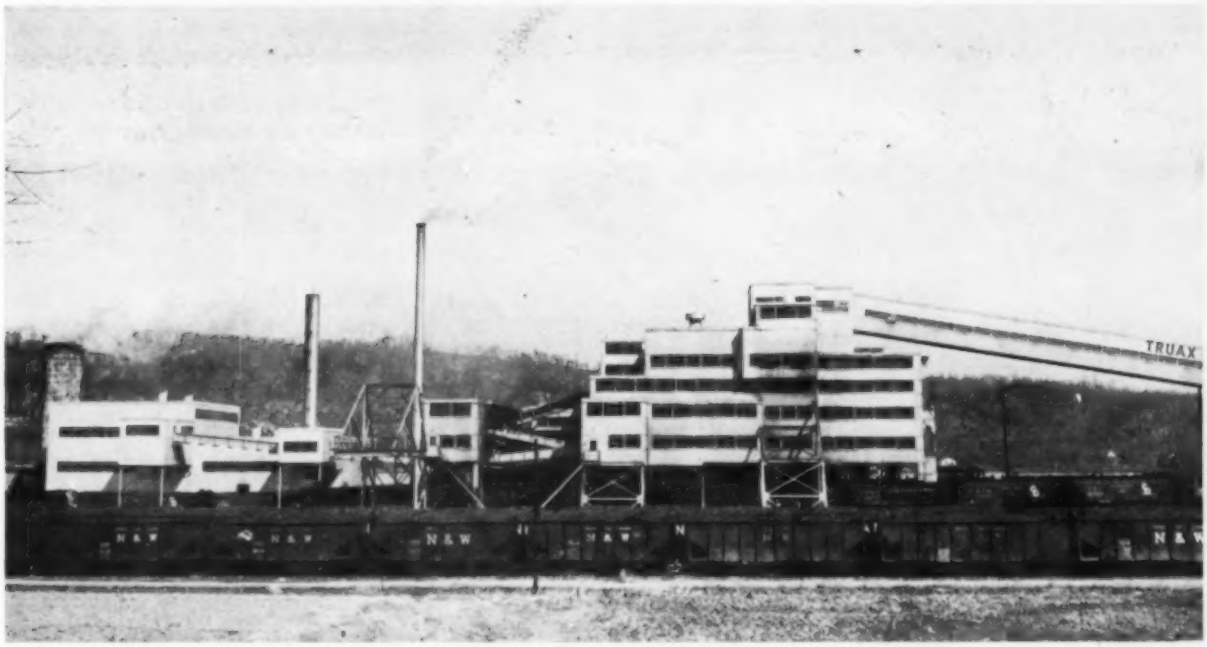


THE CEREDO PREPARATION PLANT TODAY. The building at the left between silo and the shorter steel stack houses the new heat-drying plant, which handles coal from filters and centrifuges. A special 200-ton surge bin holds filter cake.

The Ceredo Improvement Story . . .

A Fine Plant Made Better

With a capacity of 800 tph of high-volatile coals washed and blended to exact specifications, Truax-Traer's central preparation plant now includes cyclones, filters and a new-type heat dryer. Hot gases from dryer are sprayed to cut volume and speed, and the warm water is used in processing. The warm-water benefits include better mechanical dewatering.

A MATERIAL IMPROVEMENT in product quality accompanied by a reduction in fine-coal loss and a saving in time and labor have followed additions and improvements at the washing plant of the Truax-Traer Coal Co., Ceredo, W. Va. The Ceredo Plant was built to prepare various West Virginia high-volatile coals and has a clean-coal capacity of 800 tph.

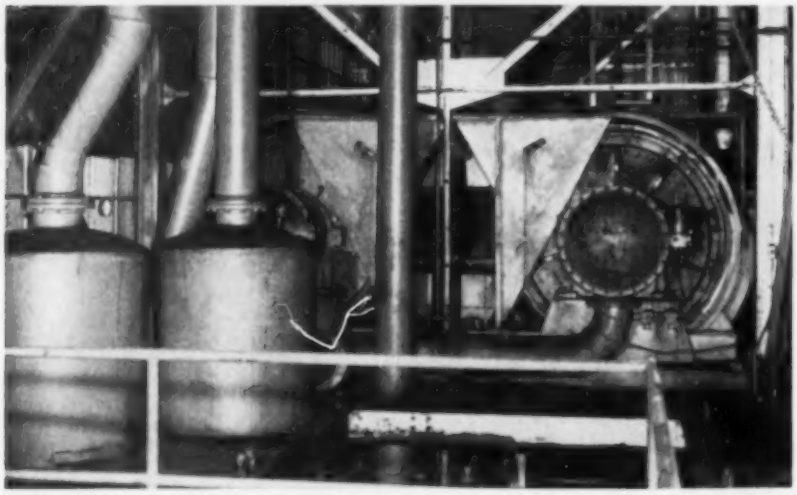
Additions include a 225-tph heat-drying plant of a new type, drum filters with metal screen surfaces, and a fine-coal surge bin especially designed to maintain uniformity of mixtures. Vibrating hammers added at the railroad car dumper save considerable labor and speed unloading during freezing weather.

The Ceredo plant, occupying a 150-acre tract on the banks of the Ohio River 80 mi from the company's mines at Kayford, W. Va., was completed in 1949 to prepare coals for the steam, metallurgical and by-product markets (*Coal Age*, August, 1950). These coals are selected and/or blended to meet the exact specifications of the purchasers. Coals can be reloaded on the C. & O. Ry. or into barges on the Ohio River. Local people claim, with some justification, that more coal is transported past the Ceredo-Kenova plant location, where the C. & O. and N. & W. railways and the Ohio River come together, than past any other point in the world.

The Truax-Traer Coal Co., with main offices in Chicago, operates under the guidance of A. H. Truax, chairman of the board and president, and H. C. Livingston, vice president of operations. H. N. Hicks is superintendent of the Ceredo plant.

Principal units of the original plant designed and installed by the McNally Pittsburg Mfg. Corp., are: single-car rotary dump accommodating cars up to 90 tons capacity; 200-ton dump hopper; 1,100-tph flight conveyor to a picking and crushing house where the coal to be washed is reduced to 8-in top size; 1,100-tph belt conveyor to raw-coal screens and to a raw-coal bypass to a 1,100-tph barge-loading belt conveyor; two six-compartment six-cell Baum jigs, one for coarse coal and the other for smaller coal; two McNally Rheo launders; 10 McNally-Carpenter centrifugal dryers; two 18-ft raw-coal settling cones; and three washed-fine-coal settling cones. The equipment, arrangements and meth-

BRINGING TOTAL MOISTURE DOWN to 3½%, the heat-drying plant has a capacity of 225 tph in a 50x120-ft building 50 ft high.



AFTER CYCLONE DESLIMING, two filters reduce moisture in 14x150-mesh coal to 18% total. Filter vacuum chambers are at left.

ods described in the following constitute additions to or changes in the original plant.

CYCLONES AND FILTERS HANDLE 14-MESH COAL

A battery of three 20-in wet cyclones in series with a battery of eight 14-in cyclones hydraulically classify 14-meshx0 from the raw-coal settling cones. Approximately 1,800 gpm is handled by the cyclones and the control pressure is kept at 35 psi on the outlet side of the eight 14-in units.

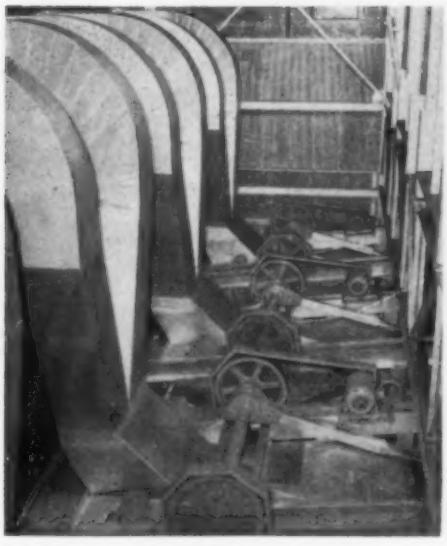
Two Peterson Type TFR top-feed-reservoir filters handle the underflow from the wet cyclones. The drum of each filter is 6 ft in diameter and 10 ft long. Screen coverings are Bixby-Zimmer triangular profile wire with ½-mm openings. Maintenance cost on these Peterson filters has been negligible over several years of operation. Solids constitute 50 to 60% of the feed and the cake product comes out with 18% total moisture. This product is 14-mesh by approximately minus 150-mesh, since the minus 150-mesh is deslimed in the wet cyclones and goes to refuse. The filter cake is mixed with the ⅜x0 product from the centrifugal dryers.

Vacuum for each Peterson filter is provided by a Roots-Connersville positive displacement blower driven by a 125-hp motor and set to maintain a vacuum of 12 in of mercury. Approximately 90% of the filter screen surface is effective. Eight Syntron vibrators inside the drum of each filter compact the cake and lower moisture.

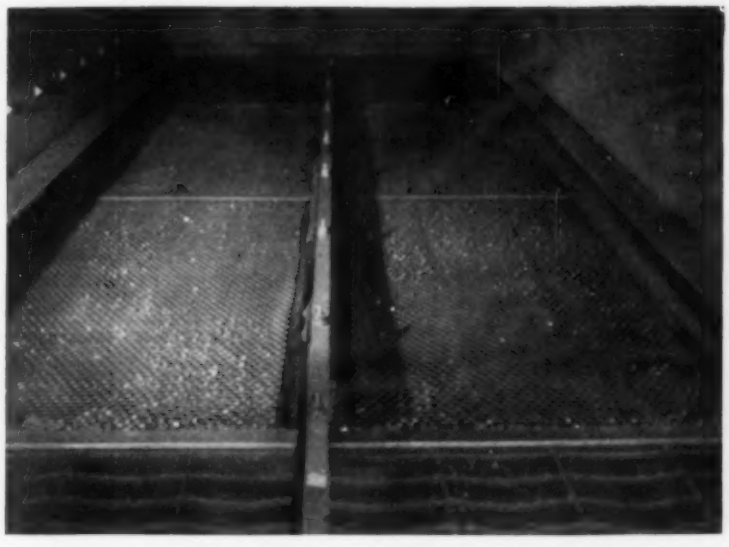
STORING FILTER CAKE

Enroute to the heat-drying plant

SPECIAL ADJUSTABLE-HEIGHT CONVEYOR is feature of surge bin for 14x150-mesh filter cake. Photo at left shows end of the conveyor with bin practically full. As it is lowered by 3,500:1-reduction hoist (right), coal moves out of bin.



FOUR HEAT DRYERS are driven by 10-hp motors with V-pulleys for speed adjustment.



HOW DRYER SCREENS LOOK from the discharge end before regular end-of-shift cleaning.

the filter cake passes through a 200-ton surge bin. During most of a normal operating shift this bin is kept practically empty. At the end it accumulates the fine coal which continues to flow for about 10 min after the coarser sizes stop. Upon starting the plant at the beginning of the next shift this filter cake is fed out from the surge bin to arrive on a belt conveying to the heat-drying plant at the same time that the ⅜x0 centrifuge product reaches this belt. The accumulation in the surge bin is fed out at a uniform rate resulting in emptying of the bin in about 1 hr.

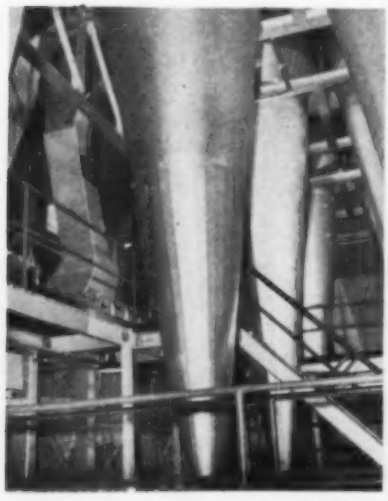
The bin is an open-top tub-like steel structure. Mounted in the bin is a drag conveyor with flights 13½ ft wide. One end of the conveyor is supported by a hoist and can be lowered like a loading boom 10 ft to the bottom of the deep end of the bin. The bottom of the bin is shaped to conform to the bottom flight path of the conveyor when lowered. Thus the flights scrape the bottom of the bin to empty it completely.

The conveyor hoist is powered by a 5-hp 1,750-rpm motor transmitting power through V-belts to a Reeves variable-speed drive, a Link-Belt worm-gear reducer and a roller chain, all providing a total reduction of 3,500:1 to the hoist drum. The result is a raising and lowering speed for the conveyor ranging from ½ to 2 in. per hour. This means that a full surge bin can be emptied in any period from 1 to 4 hr.

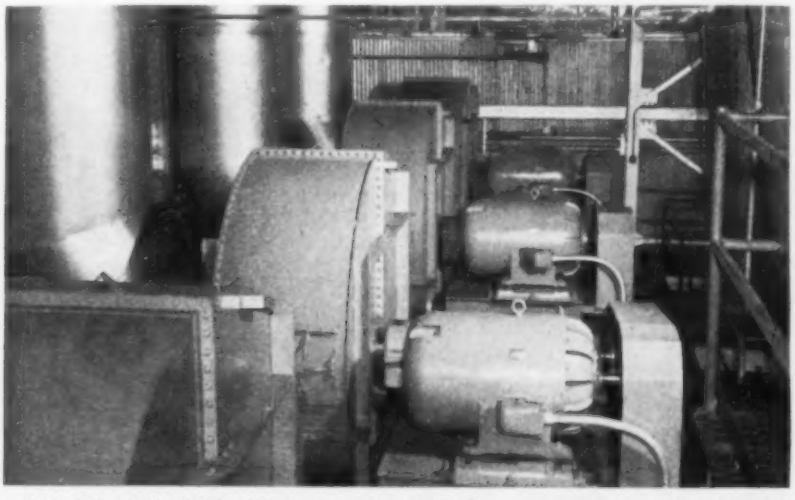
HEAT DRYING ⅜x0

The thermal drying plant, rated at 225 tph of ⅜x0, is in a new steel building 55x120 ft and 50 ft high located on the loaded-car side of the washer building. Equipment consists of four McNally-Pulso dryers of the updraft type with a 5x12½-ft single deck reciprocated by an eccentric shaft running at 150 rpm. Each dryer is fed from a 22½-ton surge bin by a variable-speed rotary feeder. Total moisture in the dryer feed is 9%, and after being exposed to the hot gases the coal comes out containing 3½% moisture, making a desirable product for marketing.

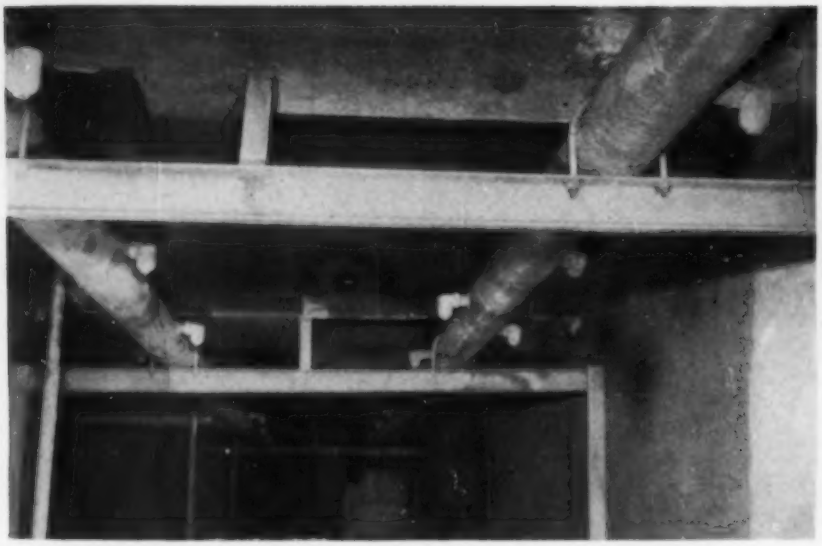
The first 5 ft of the deck beginning at the feed end is fitted with ⅝-in round-hole mild-steel plate 3/16-in thick



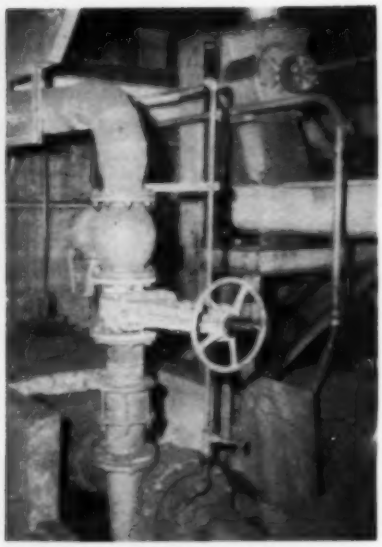
EIGHT CYCLONE COLLECTORS remove dust from dryer exhausts.



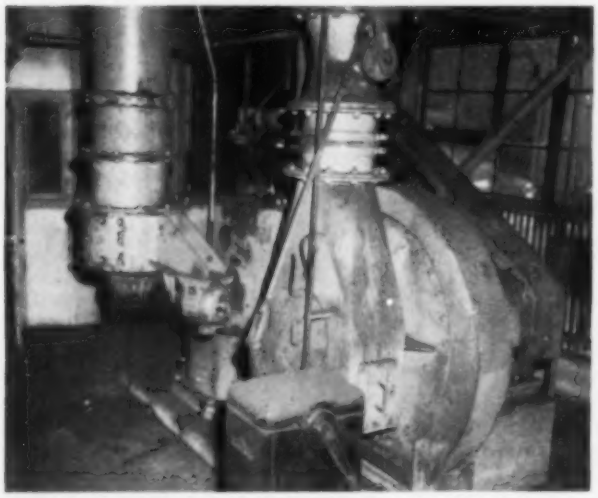
FANS ON EXHAUST SIDES of cyclones discharge down into spray chamber originally serving as the fan foundation.



CYCLONE EXHAUST is cooled in 8x8x40-ft chamber by ramp-bottom sprays attached to water pipes as shown.

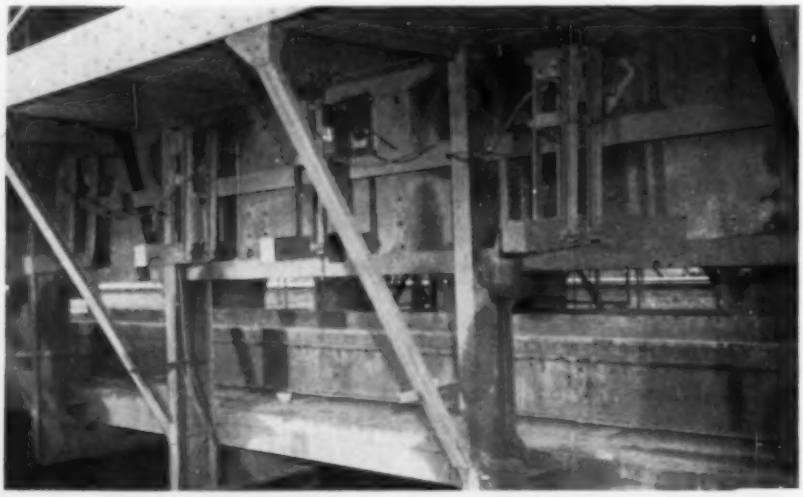


HEATED SPRAY WATER is pumped to washing-plant head tank.



ONE OF TWO PULVERIZERS supplying fuel to dryer furnaces. Dryer-plant control room is in background.

DRYER CONTROLS and indicators are on wall in control room. Dial indicates position of motorized dryer feed gate.



CLEAN CAR DUMPING is assured by electric vibrating hammers, which swing against car as it rolls over. Four of the hammers with weights on the bottom ends of the pantographs move up against the car side as it is turned over.

with approximately 25% open area. The second 5 ft is the same type of plate but with ½-in holes and 25% open area. The last 2½ ft is 2-mm Wedge Wire screen.

The bulk of the coal carries over the end of the screen and, together with the through product, drops through a weighted-gate air seal into a screw conveyor. Approximately 10%, consisting mostly of 14-mesh, is picked up by the hot gases and carried to cyclones.

Dryer decks are driven by 10-hp motors through variable-pitch V-belt pulleys providing a range of 120 to 200 rpm. Bearings of the drive shafts and eccentrics are roller type.

DRYER GAS SUPPLY

Two A.P. Green double-wall plastic-refractory furnaces, each fueled through a 5-ton hopper and a B. & W. Type B ball-mill pulverizer, supply hot gases to the four dryers. Most of the tempering air circulates through the furnace walls. Furnace outlet temperature is controlled in the range of 1,000 to 1,200 F by a Bailey thermocouple control system tied in with the furnace controls, which are actuated by 30-psi air pressure.

After the hot gas is further tempered by admission of room air through a damper controlled by a gas thermometer it is forced into the dryers by four Buffalo Type SSL fans with 40-hp motors. Gas thermometers in the dryer intake maintain the temperature between 800 and 1,000 F by control of the tempering air damper, actuated by 17-psi air pressure.

The hot gas volume through each dryer is 50,000 cfm and the temperature of the exhaust is 200 to 250 F, this being indicated and recorded in the control room by Foxboro gas thermometers. Hot gases and entrained 14-meshx0 coal from each dryer pass through eight 5-ft diameter McNally cyclone collectors, two in parallel for each dryer exhaust. Four more Buffalo Type SSLID fans driven by 100-hp motors and installed on the exhaust side of the cyclones move the cleaned gases on through an 8x8x40-ft concrete duct, or chamber, and out to atmosphere through a Neff & Fry concrete-stave silo 16 ft in diameter and 70 ft high.

To reduce volume and speed of hot gases passing up through the silo to atmosphere the coal company engineers designed and installed a water spray system in the concrete duct, or chamber, into which the 100-hp fans discharge. The result has been a one-third reduction in gas volume, accomplishing the purpose. A by-product advantage is drier coal from the de-watering screens and mechanical dryers.

WARM WATER FOR PROCESSING

Sixty ramp-bottom spray nozzles made by the Spray Engineering Co. release 1,200 gpm of river water into the concrete duct which has been coated with asphalt roof paint inasmuch as it was not designed for water resistance. The sprays reduce gas temperature from 180 to 110 F and condense approximately 200 gpm of water vapor in the gas. Volume of dust trapped by the sprays is insignificant. The used spray water contains less than 0.25% solids.

This warmed water is elevated to the washer head tank by an 8x6-in 1,400-gpm McNally centrifugal pump and then enters the washing circuit as vertical current in the Rheo units. This warmer washing water and resulting warmer coal facilitates mechanical dewatering, apparently by lowering surface tension. Passing it through the spray chamber increases the water temperature by approximately 45 deg. During a cold month of the winter, the wash-water temperature in the plant circuit was increased 13 F by adding the warmed spray water.

In mechanical dewatering the heated water has its greatest advantage with the larger particles: that is, the particles from which the water is literally shaken off. The lower total moisture of the Ceredo products following the use of heated water is in agreement with data compiled at other Truax-Traer plants which consistently show a drop in total moisture beginning in April of each year and lasting until October, as noted in an AIME-ASME Joint Fuels Conference paper by Silverblatt and Dahlstrom.

Treating equipment to add 25 lb of lime per hour has been installed to neutralize the 3.8-pH acidity of the water after passing through the sprays.

Fuel consumption of the heat dryers is 27 lb of coal per ton of coal dried. This fuel is the 14-meshx0 from the bottoms of the drying-plant cyclones, which averages 14,000 Btu, dry basis. Surplus from the cones is mixed with the other dried products.

Each of the Pulso dryers evaporates 3 to 3½ tons of water per hour. Electric power consumption of the drying plant is 2½ kwhr per ton of coal dried. As previously noted, feed to the dryer plant contains 9% total moisture, and the product 3½%.

Two men per shift operate the drying plant, one staying in the dustproof control room where all firing controls, indicating and recording instruments and motor-starting push buttons are located. The other man oils and inspects the machinery.

All motors in the drying plant operate on 440-v supplied by a newly installed 4,160-v transformer substation owned by the coal company. The whole Ceredo plant now has 207 motors, not counting fractional-horsepower units, and the connected horsepower has increased from the original 4,858 to 6,907.

PRODUCT RECORDS AND CONTROL

Another plant improvement is a scale on the raw-coal belt to record accurately the weights of coal loaded to the river, and to indicate weights for more effective metallurgical blending. This scale, a "Conveyoflo," made by Builders-Providence, Inc., required no additional head room, being actuated by an air-sensing cell operating with 35-psi air pressure. It weighs both the loaded and return sides of the belt and records the difference.

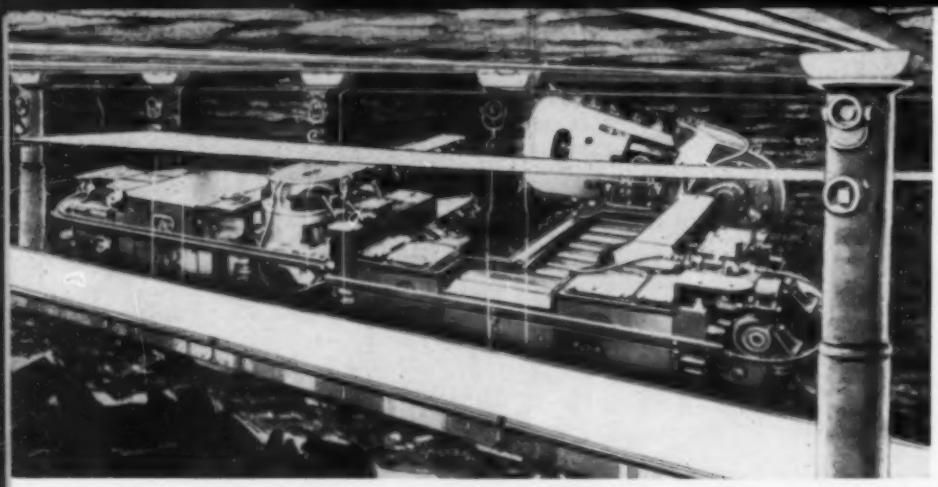
During 25- to 30-deg weather Syntron magnetically vibrated hammers added to the rotary railroad car dumper save approximately 75% of the car-cleaning labor formerly required. The hammers are hung on loose-joint pantographs to normally clear the sides of the car. As the car rolls over, gravity moves the hammers against the car sides. Three hammers on one side (the top as the car turns over) swing due to their own weight while four hammers on the other side (the bottom, as the car turns over) are moved upward by weights acting on the pantographs.

Since the original plant was described in *Coal Age* (August, 1950) the company has purchased a harbor boat driven by two 150-hp Cummins diesel engines.

The best of equipment and modern methods are employed continuously for product control. Automatic samplers of Truax-Traer design have been installed to sample the 2x0 metallurgical product. This sampler consists of a sliding gate with rectangular orifice cutting across the stream at 100 fpm. Dropping into a hopper the sample is conveyed to automatic equipment where it is riffled, crushed to approximately 100% minus ⅛-in, and then dropped through a galvanized tube to the plant laboratory on the bottom floor.

In the office building is another laboratory, termed the technical laboratory, where advanced testing is done for special determinations and experiments.

Currently the Ceredo plant is operating five days per week, three shifts per day.



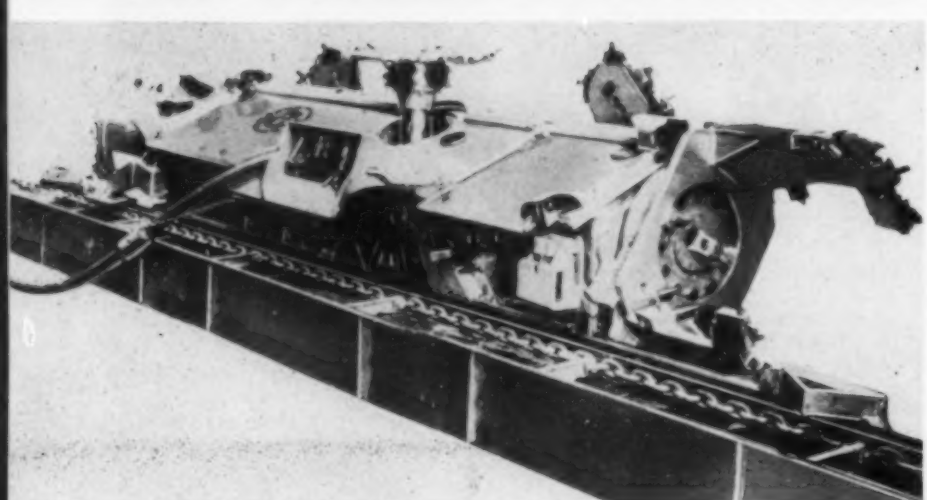
1. Cutting or Slotting Action

MECO MOORE machine cuts and loads coal onto conveyor along 130- to 150-yd face. Unit works best in 3- to 5½-ft coal.

Types of Machines Used Today . . .

2. Plowing or Wedging Action

LOBBEHOBEL mines coal with plowing action while moving across face on guide tubes bolted to face side of conveyor panels.



3. Rotary Cutting Head

ANDERSON BOYES TREPANNER is first rotary cutting unit used on longwall. Cutting head is 35-[illegible] wheel which is helped by bottom and vertical cutter bars.

How Mechanical Loaders Are Used In Great Britain Today

A roundup of the machines and methods used under varying conditions in British coal mines.

By I. G. E. LEEK
*Chief Mechanization Engineer,
National Coal Board of Great Britain

EXTRACTING longwall panels is the common method of working in Great Britain and 90% of the output is obtained this way. In most instances the depth of the seam, brittle roof and soft floor with a strong tendency to heave up in the roadway, prevent mechanized room and pillar work. But in the few places where it is practicable, good results are being obtained. In workings other than longwall, about 10% of the coal (1,800,000 tons in 1954) is loaded by continuous miners, gathering-arm-type loaders, duckbills or flights fitted to cutter chains.

MINING CONDITIONS

To appreciate the power loading problem it is necessary to know something of the general mining conditions. All the coalfields are old—in some, coal has been worked for hundreds of years. Naturally, most of the easily accessible coal has gone. The best quality seams and the thickest have been worked first. In many instances, the areas free from faults and other disturbances have been extracted and only the less attractive parts of the mines remain. Seldom is it possible to enter virgin coal and layouts usually have to take into consideration old workings either in the same seam or in others above or below. Fourteen thousand miles of roadway have to be maintained in the mines and although much reconstruction is being done to give more direct access to the working areas, the constant pressure for more output and the shortage of labor has limited the rate at which such work can be done.

The depth of working tends to increase and the average at present is about 1,200 ft with a maximum of more than 3,000 ft. Seams which are considered workable vary in thickness from about 18 in to 7 or 8 ft. There are a few (mostly valuable coking coals) worked at less than 18 in and in some cases, usually when two or more seams come together, thicknesses of up to 30 ft are found. The percentage of output obtained from seams of various thicknesses in 1953 was as follows:

1 ft 11 in and under	1.7%
2 ft 0 in to 2 ft 2 in	3.4
2 ft 3 in to 2 ft 5 in	4.3
2 ft 6 in to 2 ft 11 in	11.7
3 ft 0 in to 3 ft 5 in	13.4
3 ft 6 in to 3 ft 11 in	14.7
4 ft 0 in to 4 ft 11 in	24.5
5 ft 0 in to 5 ft 11 in	16.4
6 ft 0 in and over	9.9

Most of the measures are flat or semi-steep, but in several fields patches of highly inclined coal occur.

There are few hard floors and comparatively few instances of clear, well-defined partings between floor and seam. Fireclay frequently found under the seams is soft and very adversely affected by water. Roof measures generally consist of shales, which are seldom strong and the parting between the coal and the roof is often ill-defined. Because of the weak roof, close suport is necessary and its extent is clearly defined in the Ministry of Fuel and Power's "Coal Mines (Support of Roof and Sides) Regulations 1947." In general, the regulations require the whole area of a longwall face to be supported with bars set on not less than two props. The distance between bars must not be less than 4 ft and between props not less than 6 ft. The nearest row of props must not be more than 3 ft from the coal face. Exceptions can be obtained for certain conditions and to enable certain machines to be worked, but the need for close support—which is a very real one apart from any question of regulations—complicates the application of power loaders.

THE OVERALL PICTURE

At the end of 1954, the total number of mechanical loading machines was 371 longwall and 109 room and pillar units whose output was 19,606,000 long tons, or 8.34% of the total. It is interesting to compare the growth of power loading in Britain in the past 5 yr with that in the U.S.A. about 20 yr ago.

Progress over a 5-yr period in the two cases was as follows:

Percentage of Power-Loaded Coal

	U. S. A.		GREAT BRITAIN
1931..	6.2%	1950..	3.88%
1932..	6.1%	1951..	4.16%
1932..	6.5%	1952..	5.25%
1933..	6.5%	1953..	6.37%
1934..	7.0%	1954..	8.34%

In the early stages of mechanical loading, progress in Britain has been rather more rapid than it was in the U.S.A. at a corresponding stage of development. The question now is how far can we go and how fast? It is doubtful if the present U.S. percentage of over 60 can ever be obtained in Britain because of unfavorable natural conditions. A study of the present trends suggests that fairly rapid progress up to 20% or 30% is possible, followed by a slower advance to a maximum which may lie between 40 and 50%.

Prepared-Coal Loaders

There are available for use a number of machines which will load coal once it has been well prepared and some of these are fulfilling a very useful function.

Cutters are themselves being widely

* Position when article was written. Now overseas general manager, Dominion Steel & Coal Corp., Ltd.

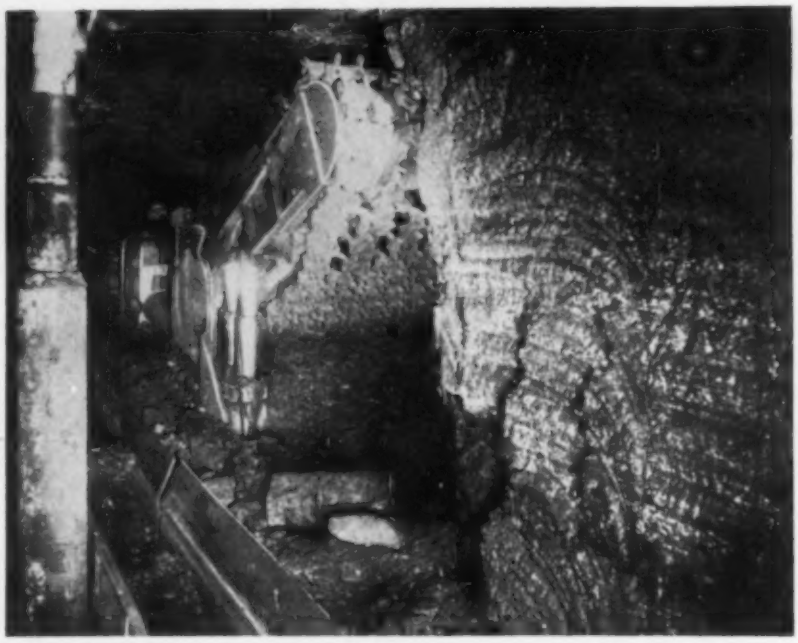
adapted to load coal after it has been cut and prepared by shotfiring or other means. The idea probably originated in Durham where the first Lambton flight was manufactured and fitted to an Anderson Boyes arc-walling machine in a narrow heading. For some years the system was confined to room-and-pillar work but it has spread recently to longwall. The Lambton flight is a simple paddle device which can readily be fixed to a cutter chain. The cutter must, of course, have the necessary clearance around the sprocket for the passage of the flight.

Local ingenuity has produced many variations of the flight-loading idea. In some instances flights themselves are dispensed with and the cutter chain running in reverse proves adequate for loading well prepared coal. Some of the flight loading machines operate on top of armored flexible conveyors. Others straddle a bottom loading belt conveyor and yet others work in a separate cutter track.

From a bulk output point of view the flight loader is a cyclic machine in that there must necessarily be a cutting cycle followed by a loading cycle. A modern powerful cutter, under the right conditions in coal of reasonable hardness, should be able to take a 6-ft cut across a 200-yd face in 2 to 3 hr. Loading back and auxiliary operations, such as fitting flights and advancing the conveyor, should be easily possible within the remainder of a normal working shift. For each foot of seam thickness, therefore, a flight loader should be capable of producing 130 tons per shift, providing a 200-yd face is available. On a shorter face it may be possible to advance twice within a shift, but the daily output might be restricted by such auxiliary operations as roadway advancing. With a 6-ft advance per shift it should be possible to do this on each of two shifts per day. In a 3-ft seam this would give an output of some 750 to 800 tpd.

In 1954, 42 flight loading devices were in use on longwall faces in Great Britain, producing a total of 1.26 million tons at a face output of 5.18 tons per manshift. The theoretical output was not achieved, highest tonnage produced being from a face 205 yd long in a seam 6 ft thick, from which 260 tons per shift and 475 tpd were obtained during the last quarter of the year.

The Huwood loader is a separate machine using the principle of flight loading prepared coal onto a conveyor. There were 21 of these loaders in use in British mines in 1954, producing 894,000 tons with an output of 4.87 tons per manshift. The machine is not able to travel nearly as fast as a modern high powered cutter fitted with flights and it is not therefore as helpful from the point of view of concentration of output.



DOSCO MINER is a powerful unit that uses seven chains to rip out a 58-in-wide strip 18 in deep. Cross conveyor transfers coal to face conveyor.

Two other machines have recently been developed for loading prepared coal on longwall faces. The Distington mobile-duckbill loader is an adaptation of the well-known duckbill to longwall work by mounting it on crawlers. The Mossfield plow loader uses a scraper-bucket type of loading device operated by a winch in the gate heading and running on the armored conveyor. Neither of these machines has undergone enough tests for its effect on output to be estimated with any accuracy.

Mining and Loading Machines

Machines requiring a preparation phase obviously are at a disadvantage in comparison with units which can produce coal throughout all or the greater part of their working cycle. It is the combined mining and loading machine which offers the best opportunity for concentrating output. There are 11 of these machines now in use on longwall faces in Britain and it is convenient to list them in three groups according to their cycle of operation.

Group 1. The following machines can work almost continuously: Löbbehobel, or fast plow; Schramhobel, or slow plow; Huwood slicer; Multi-Plow; and scraper box.

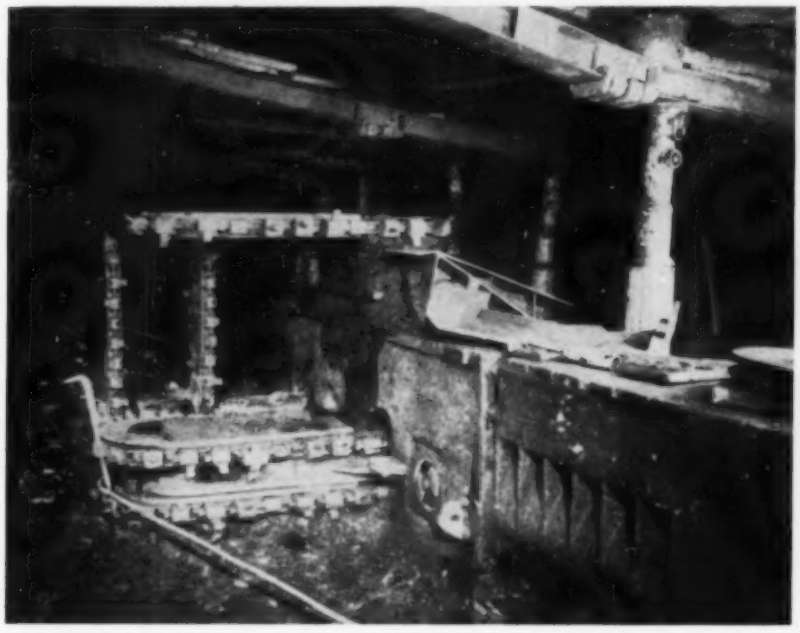
The only unavoidable delays are those which occur while the conveyor drives or the scraper-box pulleys are being moved forward.

Group 2. The following machines comprise the semicontinuous group: Anderton shearer-loader; Gloster Getter; Samson stripper; Anderson-Boyes trepanner.

Each of these machines loads coal while traveling in either direction, but at each end of the face the machines themselves have to be moved forward into a fresh track. This takes varying periods of time up to about 1½ hr. The section or slice of coal taken by the semicontinuous group is wider than that in the fully continuous group and ranges up to about 30 in as compared with a maximum of 12 in for the latter.

Group 3. The third, or cyclic group, includes the Meco-Moore cutter-loader and the Dosco miner. Each of these machines cuts and loads coal from end-on wall faces 5 ft or more wide. The Dosco miner cuts in one direction only and must either be turned around as a whole or dead-headed back across the face before a second cut. The Meco-Moore cutter-loader can cut in both directions but only after the cutting end has been turned around and attached to the opposite end of the loader portion.

The machines can also be classified according to the manner in which they attack the coal. The three basic meth-



GLOSTER GETTER can cut in both directions without having to be turned around. Machine operation is simple and similar to standard longwall unit.

ods of attacking coal are as follows:

1. Cutting or slotting action. Machines using this method are the Meco-Moore, the Dosco miner, the Gloster Getter and the Anderton shearer-loader.

2. Plowing or wedging action. Examples are the Westfalia Löbbehobel, Gusto Multi-Plow, Huwood slicer, Ritchie Schramhobel and scraper boxes.

3. Rotary cutting head. The Anderson Boyes trepanner is the only machine of this type at present available for longwall work.

Cutting and Slotting

MECO-MOORE MINING

The Anderson-Boyes Meco-Moore cutter-loader, which has been in regular use for more than 10 yr, is designed for simultaneous cutting and loading and is rope-hauled in either direction on conventional longwall faces. The machine is built up from a cutting portion and a loading unit. These are coupled together when the machine is operating but are readily separated so that the cutter portion can be turned around to cut in the reverse direction.

The cutting assembly consists of three parts: a haulage unit similar to that of the conventional coal cutter, a motor unit containing two 60-hp motors mounted side by side, and a gearhead which drives two horizontal cutting bars and transmits power to the loading unit from which the vertical shear bar is also driven.

The loading section consists of a main framework within which is mounted a short belt conveyor fitted with steel straps; loading bars at the side of the conveyor help to load the coal on to it. The conveyor with its gummers and the loading bar is driven through gear boxes attached to each end of the loader structure. On the face side of the loader structure is mounted the reversible triangular shear bar which is driven from a gear box at the driving sprocket end.

A modified design of gearhead can be fitted to permit the height of the upper bar to be adjusted hydraulically within a limited range. When this type of head is fitted, roof cutting can be carried out at all normal working heights. Three different sizes of adjustable turret permit elevating ranges of 7, 9 or 12 in.

Overall length of the 10-ton machine is 17 ft, width of the cutter unit is 3 ft and bars can be supplied in various lengths to suit local conditions.

Meco-Moore Results—The thinnest seam which the Meco-Moore will cut and load is 3 ft and difficulties usually are encountered with seams thicker than 5 to 5½ ft. Roof conditions must be reasonably good and unless the machine is arranged so that the upper bar cuts at roof level, the parting between the roof and the coal must be such that the top coal will fall after the lower part of the seam has been removed. Seams containing iron, stone or pyritic intrusions must be avoided since the searing bars cannot cut through them. Sometimes difficulty is caused by coal breaking into larger blocks than can be handled by the conveyor system, and the machine is therefore held up while these lumps are broken by hand or air pick.

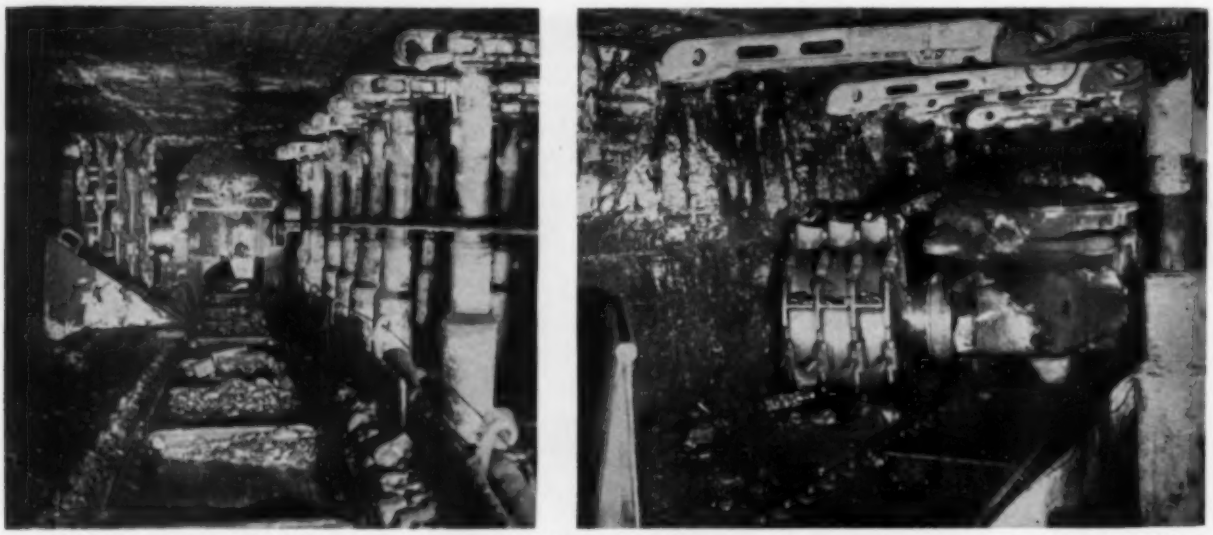
The usual length of a Meco-Moore face is between 130 and 150 yd. In a number of instances double-unit faces with one machine on each side have been worked. Gradients ranging up to about 1 in 5 in line with the face have been successfully mined. If the gradient at right angles to the face does not exceed about 1 in 7, dipping or rising, the machine can be worked, although a level face is preferred.

The Meco-Moore usually cuts and loads on one shift per day, with turning around and maintenance being carried out on the succeeding shift. In a few cases double-shift working has been successfully adopted with three cutting sections and one loading unit employed on the one face. As soon as the machine completes one normal cut a rapid turn around is made, the loading portion being attached to one of the spare cutting portions which has been positioned ready for the next cut. The face conveyor is also moved rapidly forward into the new track. It is possible for the second cut to start about 1½ hr after the end of the first. At the end of the second cut the other spare cutting portion is attached to the machine and maintenance is carried out. Space is required at each end of the Meco-Moore face to permit turning. Double-shift operation of the Meco-Moore has resulted in an advance of as much as 9 ft per day. A high standard of organization and team work is required.

In 1954 Meco-Moore cutter loaders produced nearly half the longwall power-loaded output in Britain. The 127 machines mined 8,467,900 tons, and the average output was 6.63 tons per manshift. A number of machines produced over 3,000 tons per week and the highest individual output per man-shift from any one machine was 12.35 tons.

THE DOSCO MINER

The Dosco miner was produced some 5 yr ago for use in the mines of the Dominion Steel & Coal Corp., Nova Scotia. It is a crawler-mounted machine made up of a frame section and a sliding section. In the crawler-mounted main frame are mounted the electric motors and control gear, hydraulic tanks, pumps, motors, controls and auxiliary equipment. The sliding section fits on tee slides on the main



ANDERTON SHEARER with shearing disks (left photo) mounted on shaft 90 deg to machine frame is taking full seam. Drum-type unit (right) takes only part of seam where top coal does not fall easily or is needed to support roof.

frame and has an 18-in longitudinal movement. This section carries the cutting head, the bar-lifting mechanism, the plows and the cross conveyor. Two 75-hp water-cooled motors drive the cutting chains through telescopic drives. A 30-hp water-cooled motor drives the hydraulic pumps.

The cutting head is fitted with seven Austin-Hoy ball-joint chains which provide a cutting width of 4 ft 10 in at the nose end, narrowing down to a 38-in driving width between the gear boxes. This chain arrangement permits the machine to cut clearance for its own passage.

In action the machine approaches the longwall with the cutting head in the down position. With the chains revolving and the cross conveyor running, the cutting head is sumped in at the bottom of the seam to a depth of 18 in. It is then lifted the whole thickness of the seam or to some predetermined height, and then retracted and lowered. The machine then moves forward 18 in on its crawlers in readiness for the next cut. As the coal is cut, the chains carry it to the cross conveyor which then delivers it to the face conveyor. The cycle of operations is repeated across the face.

The machine cuts a path 5 ft wide and is suitable for seams 5 ft or thicker. It is easier to handle if the gradient at right angles to the coal face is small. However, it has worked up and down seams as steep as 1 in 3, and with the assistance of a winch it can work in even-steeper coal. It is a very powerful unit, suitable for the hardest and toughest coal, and will produce well over 100 tph from any but the very hardest seams. The length of face depends upon the working time available and can be planned at about 35 yd of cutting per hour. In the accompanying illustration, Dowty hydraulic props and G.H.H. link bars were used and their excellent roof-control characteristics and quick setting features were found to be very valuable.

In Nova Scotia up to 600 tpd are being mined with this machine. In Britain the first machine was put to work in the very hard, tough Stockings seam in the South Derbyshire coalfield near the end of 1954. Although the application was only on a previously prepared 100-yd face, the machine gave excellent results from the start and produced more than 12 tons per manshift. Two other machines have since been put to work in Britain with similar results.

GLOSTER-GETTER PRODUCTION

The Gloster-Getter longwall cutter loader was invented by W. V. Sheppard, area general manager, No. 1 Area, East Midlands Div. of the National Coal Board. It was developed by the mechanization staff of that area in conjunction with Joy Sullivan Ltd.

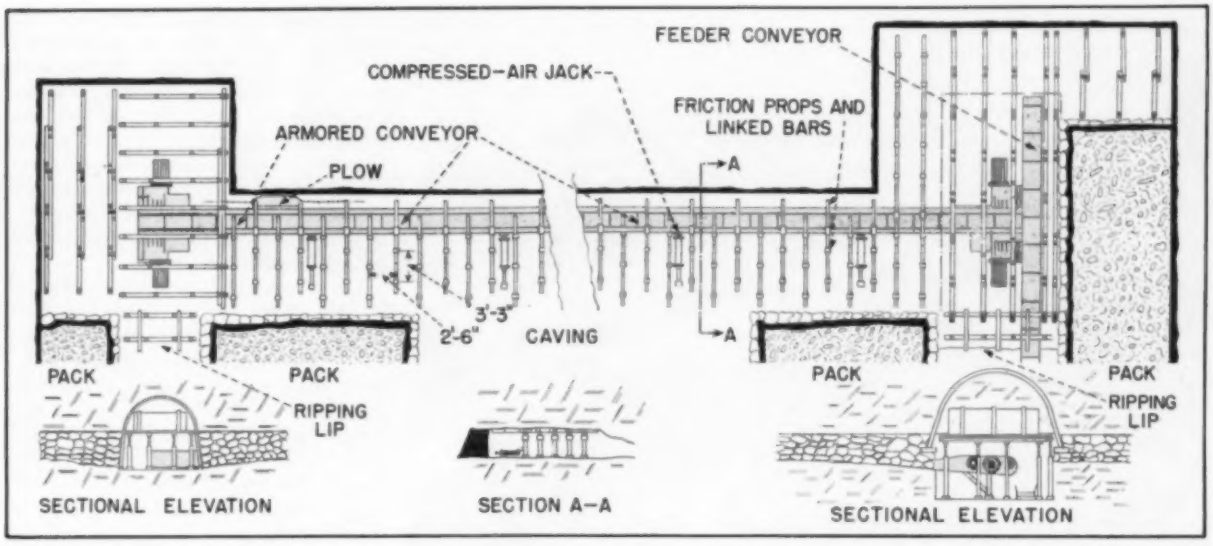
The machine includes a motor section, center-cutting unit and traction assembly, all mounted on a baseplate. A 62-hp electric motor drives the cutting chains and hauls the machine along the face by means of a rope coiled around a vertical enclosed-rope drum.

Two straight 34-in bottom bars are mounted on the cutting unit in a fixed horizontal position. A turret-mounted 30-in horizontal bar is mounted on the top of the machine. All three of these bars are in the same vertical plane. Two vertical-shear bars are mounted on a swivel jacket which is carried between the bottom bars.

The machine is designed to cut in both directions without having to be turned around at the end of the face. The shear bars can be reversed and easily swung round to the opposite side of the horizontal bars. The cut coal is carried onto the face conveyor by a loading chute behind the shear bars. This chute also can be detached and placed at the opposite end of the machine for the reverse run. The operation of the Gloster-Getter is quite simple and is generally similar to that of the standard longwall cutter. A recent modification has been the fitting of a powerful gumming attachment on the conveyor side of the machine and this has considerably improved the performance.

The Gloster Getter normally works in seams ranging in thickness from 32 to about 54 in. Where the coal separates easily from the roof and the top-cutting bar can be dispensed with, the machine will work in seams as thin as 28 in. A specially designed roof bar with a hinged section has been used at this colliery to permit the supports to be set close to the face at all times.

The Gloster Getter works well in hard and tough coal seams. It has generally been installed on 300-ft faces where it takes two or three narrow cuts per shift and work two shifts—in a few cases three shifts—per day. In 1954, 17 machines loaded 569,000 tons with an average output of 5.26 tons per manshift. In the first quarter of 1955, the best performance was 6.39 tons per manshift.



LOBBEHOBEL MINING PLAN includes faces about 600 ft long and roof control with rock packs. Friction props and linked bars provide support at face. Machine works best on hard, smooth floor in soft coal. Cuts are 2 to 6 in deep.

THE ANDERTON SHEARER-LOADER

The Anderton longwall shearer-loader was invented by J. Anderton, area general manager, No. 3 Area, North Western Div., National Coal Board, and his mechanization staff. The machine is now manufactured by Anderson-Boyes, British Jeffrey Diamond, Cowlishaw Walker and Mavor & Coulson in Great Britain, and Eickhoff on the Continent.

The standard longwall coal cutter forms the basis of the Anderton machine. The normal cutting end is replaced by a special gearbox with a horizontal shaft projecting toward the face at right angles to the machine. A set of shearing disks or a drum fitted with cutter-bit holders is mounted on the horizontal shaft. The number of disks or the width of the drum is varied to suit the hard seams and the depth of cut required. It is normal to employ about four disks, each carrying 4 to 8 bit holders fitted with special carbide-tipped bits. The depth of cut usually varies from 16 to 22 in, although on occasions deeper cuts up to 27 in have been used. The cutting diameter of the disks also varies. In one case it has been as small as 30 in to the tips of the bits and in others it has been as large as 54 in. Where the top coal will fall readily when undercut, it is the usual practice to cut out only the lower part of the seam, but where the top coal does not fall easily or it is necessary to leave coal to provide a strong roof, large disks or drums have been used to take out the entire worked portion.

When adapted as an Anderton shearer-loader, the coal cutter is fitted with continuous-type haulage and is mounted on an armored flexible conveyor by a specially designed underframe which raises it to such a height that the disks cut at floor level. A fabricated plow attached by a rigid coupling to the rear of the machine is designed so that it will work in either direction. During the cutting run the plow deflects the cut coal onto the conveyor, and during the reverse run it loads loose coal which has been left in the track of the disks. A cable carrier generally is provided to ride on the conveyor at the front of the shearer loader.

Shearer-Loader Results — The normal working heights of this machine are from 42 in to about 5 ft. It is possible to work thinner seams but the efficiency of the machine rapidly decreases and in seams thicker than 5 ft it is usually either difficult to get the top coal down or it comes in very large blocks which are difficult to handle on the conveying system. The length of face which can be worked is limited more by the conveyor than by the Anderton shearer. The best length seems to lie between 200 and 300 yd, depending on the gradient. On the clean-up run the machines can travel at speeds up to 40 fpm.

In this setup the roof is supported on girders which slide forward through specially shaped heads mounted on the tops of the props.

This machine can easily and quickly be produced from standard coal cutters and operation is quite simple. There has not yet been much experience with it on grades but it should be possible to use it on any grade where coal can safely be carried on a conveyor, provided, of course, that suitable safety devices are fitted to prevent the machine from running away.

In 1954, 28 machines produced 1,011,800 tons with an average output of 5.79 tons per manshift at the face. The best machine produced 9.42 tons per man in the first quarter of 1955.

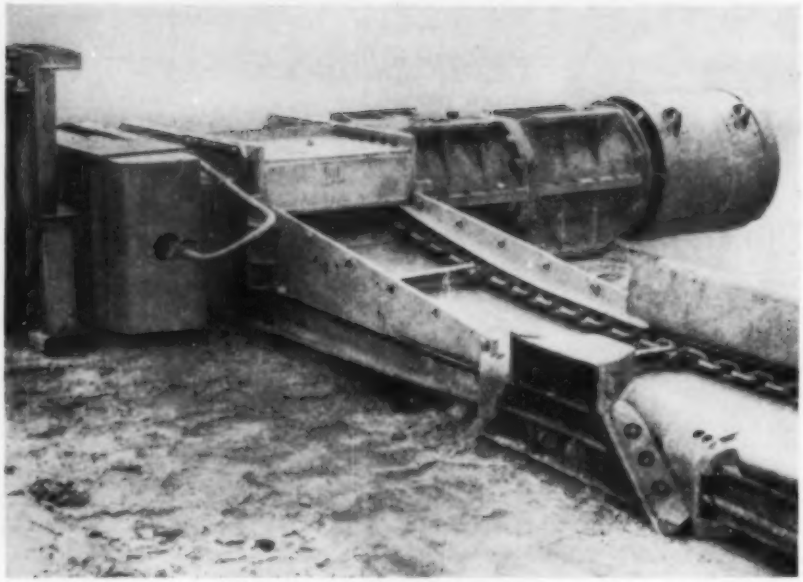
THE MULTIBAR CUTTER-LOADER

Hard coals less than 30 in thick present a very difficult power-loading problem. Such seams have so far been mined by flight-loading coal which has been prepared by undercutting and blasting. In an attempt to provide power-loading facilities for such seams both Mavor & Coulson and British Jeffrey Diamond have fitted banks of bars to their coal cutters. The bars cut out the whole seam, plus any top coal that falls readily. The product of the bars, which is mainly small coal, is loaded onto the conveyor by a powerful gumming device. Encouraging results have been obtained from early trials of several different designs of multibar machines.

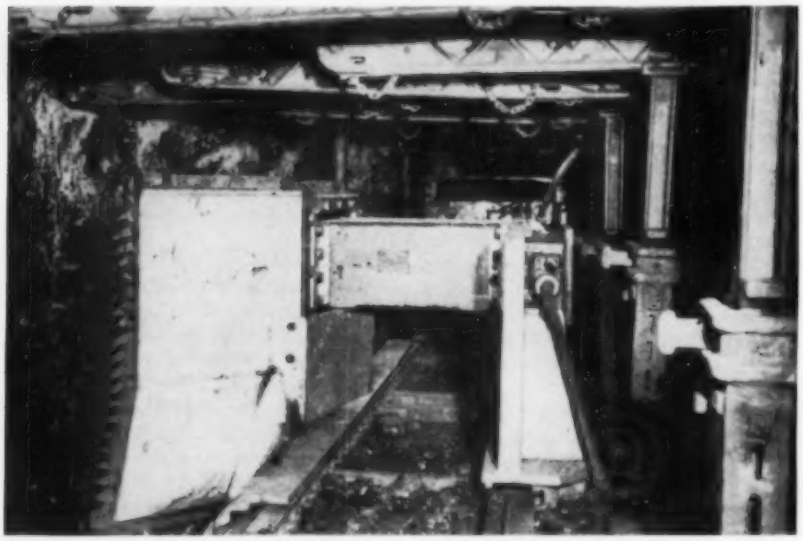
Plowing and Wedging

THE LOBBEHOBEL AND ANBAUHOBEL

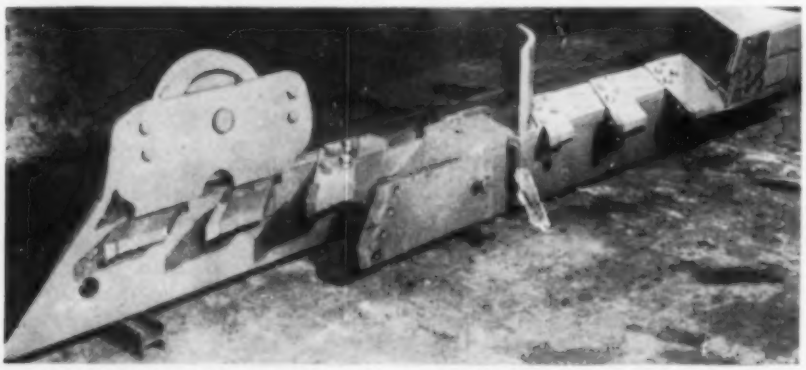
The Westfalia-Lunen Löbbehobel is fitted to the standard Westfalia-Lunen PF1 conveyor and runs on guide tubes which are bolted to the face side of the conveyor panels. An endless chain drives the plow and returns inside the guide tubes. Two baseplates, which project beneath the conveyor, guide and stabilize the plow.



GUSTO MULTI-PLOW has several plowing units, spaced 15 to 40 yd apart, connected to the conveyor and driven from the conveyor heads.



HUWOOD SLICER is believed to be only plow with activated blade. Toothed plow blades have small reciprocating vertical stroke.



SCHRAMHOBEL, featuring a variety of cutting knives, takes cuts up to 12 in deep while traveling 10 to 20 fpm. Unit is hauled by winches.

In the case of the Löbbehobel, both the plow chain and the conveyor chain are driven by the same motors and gears, but with the Anbauhobel separate drives are used. This enables two plows to be used on the face where necessary, each being operated from one drive head. This may be a considerable advantage where the face is interrupted by a small fault or other natural obstruction.

Large cutting bits are fitted to the leading edges of the plows and cuts varying from 2 to 6 in deep can be taken according to the hardness of the coal. In Britain coal soft enough to permit more than about a 3-in cut is very seldom found. Plows are normally built 18 in high but extension blades can be fitted to give a maximum height of 34 in. The rate of travel of the plow is 75 fpm and the pull required varies up to a maximum of about 20 tons.

A very soft coal is essential for the Löbbehobel and all other types of plows, and the coal must separate easily from roof and floor. The machine works best on a hard, smooth floor and grades are a limiting factor only so far as conveying the coal is concerned. The minimum thickness which can be worked is about 20 in and there is no upper limit, provided the top coal falls freely by gravity.

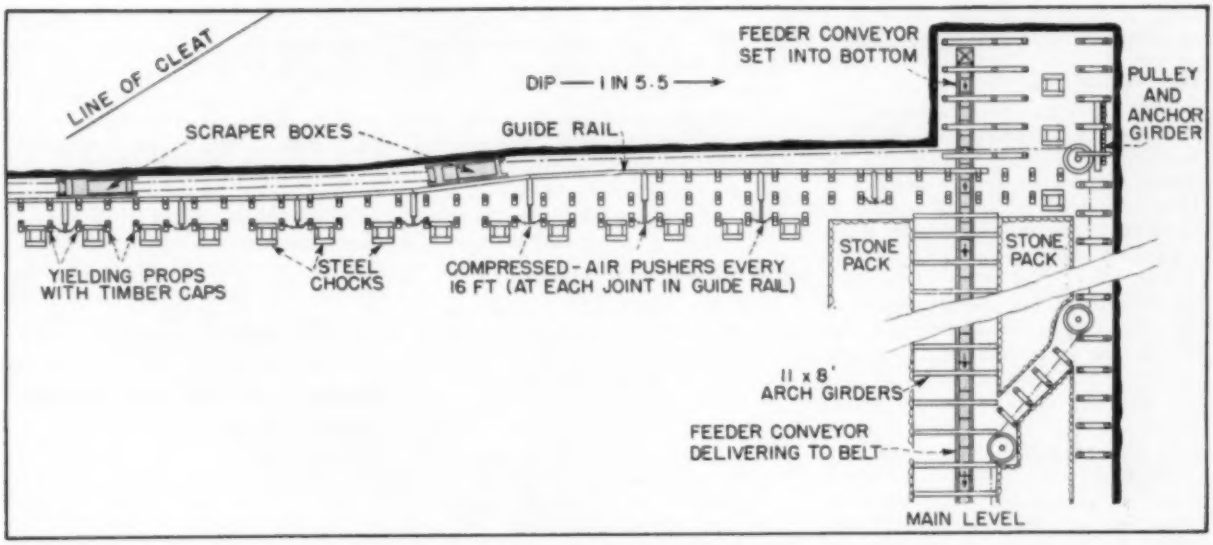
Faces up to about 200 yd long can be worked on the level, and with a favorable grade a 300-yd panel is practicable. Although most seams in Britain are too hard for this type of plow there were 18 machines in use in 1954, producing 811,200 tons with an average face output per manshift of 4.86 tons. The best machine in the first quarter of 1955 produced 6.10 tons per manshift.

SCRAPER-BOX PLOWING

The modern Haarmann scraper box was designed by Dr. Haarmann. A series of open boxes fitted with scraping knives is hauled to and fro on the coal face by a powerful winch stationed in the gate road. At the rear of each box a hinged door is fitted and the boxes scrape coal from the seams by means of their knives and pass it forward from one to another along the face. Winches in the 200- to 300-hp range are usual.

A guide rail and pushing cylinders press the box into the coal face sufficiently hard for the knives to dig into the coal and rip it off.

The winch incorporates two rope drums driven through planetary gearing, each drum in turn being used to pull boxes while the other drum runs freely. Brakes on the drums of the planetary gears control box operation.


LINE OF CLEAT
FEEDER CONVEYOR SET INTO BOTTOM
DIP — 1 IN 5·5 →
PULLEY AND ANCHOR GIRDER
SCRAPER BOXES
GUIDE RAIL
STONE PACK
STONE PACK
YIELDING PROPS WITH TIMBER CAPS
STEEL CHOCKS
COMPRESSED-AIR PUSHERS EVERY 16 FT (AT EACH JOINT IN GUIDE RAIL)
11 x 8' ARCH GIRDERS
FEEDER CONVEYOR DELIVERING TO BELT
MAIN LEVEL

SCRAPER-BOX MINING PLAN features steel chocks and yielding props for roof support in seams 1 to 5 ft thick. Compressed-air pushers keep guide rail tight and press box into face hard enough to dig into coal.

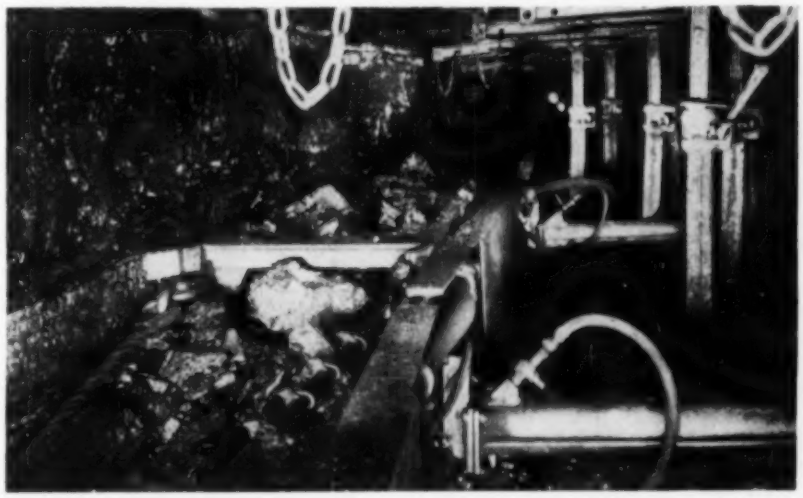
Running speed is generally about 200 fpm and box stroke is about 15 yd.

The ropes are guided by a strong pulley frame which must be very firmly held in position. At the end of the coal face long girder frames are employed in which the pulleys can be advanced by a few inches at a time during the working shift. The pulley frames themselves are moved forward between shifts.

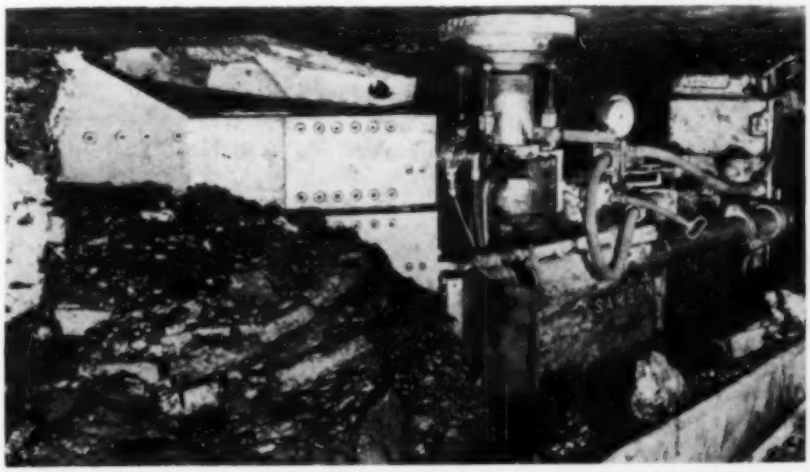
Scraper boxes can operate only in soft, plowable seams, and they require a hard, smooth floor from which the seam separates easily. A good break at roof level is also necessary since the scraper boxes attack only the lower portion of the seam and depend on the upper portion falling by gravity. In Britain, scraper boxes have been used in seams varying in thickness from 1 to 5 ft.

It is often possible to locate the driving winch of a scraper-box system so that the ropes can be led in different directions suit different faces, working on different shifts, thus reducing considerably the capital investment. Very long faces are not an advantage since the capacity of an installation is ruled by how much coal the box at the loader end can move, multiplied by the number of hauls per shift. Where double-unit working is practicable a more even flow of coal is possible and the tonnage per district increased.

In Britain scraper boxes have generally been used in thinner seams ranging from about 18 in to 3 ft, and output per shift generally has not been more than 150 to 200 tons. In 1954 three installations produced 154,600 tons with an average of 4.47 tons per man at the face. The best



SCRAPER-BOX PLOW (left) is pressed into coal face by guide rail and pushing cylinders. Pulling winch has two rope drums driven through planetary gearing.



SAMSON STRIPPER works best in soft coal that separates readily from roof and floor. Roof control is very important with this machine.

result in the first quarter of 1955 was an output of 6.24 tons per manshift.

THE SLOW PLOW

This plow, manufactured by J. Brand, of Hamborn, and designed by Campbell Ritchie, is used with the armored conveyor but is hauled by winches placed in the gate roads at each end of the face. The plow is designed to take cuts up to 12 in deep and to travel at a speed of between 10 and 20 fpm. A special feature of the plow design is the variety of cutting knives, each with a different specific purpose. The first blades to meet the coal are thin, horizontal knives which make a cut at a height of about 1 ft. This eases the work of the horizontal and vertical main blades which follow and carry out the most difficult task—that of cutting out the right angle of coal at the bottom of the seam. In any but very soft coals a pulley is used at the front of the plow so that the winch may operate on double purchase. Deflecting plows are provided to guide the coal onto the conveyor.

There is little difference between the application of the Ritchie Schramhobel and the Löbbehobel. Roof support also is on the prop-free-front system. In most cases a single-ended plow is used and only coal spilled in the plow track is loaded on the return run. Double-ended plows can be used but in the soft coals for which plowing is suitable there normally is enough spillage for coal loading to be fairly continuous with the single-ended model.

In 1954, eight Schramhobel plows loaded 406,000 tons with an output of 4.65 tons per manshift. In the first quarter of 1955, the most successful Ritchie plow produced 7.93 tons per manshift.

GUSTO MULTIPLOW

This machine, product of Gusto Mijnbouw, of Holland, has plowing units attached to the armored conveyor and driven from the conveyor driving heads. In that respect it resembles the Löbbehobel, but in this case several plows, spaced between 15 and 40 yd apart, are used on each installation, and these are shuttled to and fro like the scraper box. A special feature of the Gusto Multiplow is its narrow overall width which, when the small size of armored conveyor is used, is only 30 in, or 12 in less than any other type of plow. This can be very useful when roof control is difficult.

Early models of the multiplow used rope drives, but chains are now fitted at the two driving ends where heavy rope wear took place.

The plow works in soft coal only and is applied in a similar manner to that of the Löbbehobel and Schramhobel, a prop-free-front system of roof support being used.

A number of multiplows are in very successful use in Holland and in other Continental mines. Early experience with four installations in Britain have been encouraging but it is not yet possible to quote operational results.

THE SAMSON STRIPPER

The Mavor & Coulson Samson stripper differs from other plowing units in being self-propelled along the face by ropes or chains. The operation of the machine is entirely hydraulic, power being provided by a 20-hp electric motor. The plow cuts in both directions by means of blades such as those shown in an accompanying illustration. A strong vertical hydraulic jack is set between floor and roof to act as a base from which the horizontal jacks push the plow blades into the coal 31 in and remove a 2-ft slice of coal. At the end of each stroke, the vertical jack is retracted, moved forward on the horizontal jacks and reset.

The minimum working height for the Samson stripper is 4 ft and, like all plows, it can only deal with soft coal with easy roof and floor partings. Roof control is especially important with this machine, since the action of the vertical jack depends on a strong unbroken roof where little separation has been permitted to develop between the layers of strata. The stripper loads its coal onto an armored conveyor and can work on faces as long as 200 yd—or more where the gradient is in favor of the conveyor.

Under the right conditions and with a high standard of roof control, the Samson stripper will give both a good bulk output and a high output per manshift. Two or three coaling shifts can be worked per day if required. In 1954 six machines produced 415,000 tons with an output of 6.36 tons per manshift. The best output in the first quarter of 1955 was 8.54.

THE HUWOOD SLICER

Hugh Wood & Co.'s slicer is believed to be the only plow now operating with an activated blade, but trials are about to start with another activated plow designed by the Central Research Establishment of the National Coal Board.

The Huwood machine has a framework which straddles the armored conveyor and is guided by it. The frame carries an electric motor which provides power for the toothed plow blades which have a small reciprocating vertical stroke. Propulsion is by means of chains driven by winches located at the conveyor driving heads. The machine is double ended and has a maximum depth of cut of 12 in.

The slicer works in soft coals 4 ft or more thick and encouraging results have been obtained from the early trials. But it is not yet possible to give production figures, or to say positively what advantage, if any, the activated blade has from a coal mining point of view. In several of the trial installations it has been necessary, as with other types of plows, to soften the coal by means of precutting.

Rotary-Head Machines

ANDERSON-BOYES TREPANNER

Although several types of rotary cutting heads have been successfully used in machines designed for room and pillar work, the Anderson-Boyes trepanner is the first example of such an application to a longwall machine. The cutting head in this case consists of a 35-in diameter trepanning wheel assisted by a standard bar cutting at floor level and another one taking a shear cut at the back of the machine The trepanning wheel has two arms, each of which carries eight cutter picks. A thin annulus is cut in the coal by the revolving trepanner arms, and the core of coal which forms inside the wheel is broken up by large breaker picks fitted to the inside of the arms. The action of the arms sweeps the broken coal sideways onto the face conveyor.

The latest type unit has cutting heads fixed at each end, mounted on gearheads and driven by a single 70-hp air-cooled electric motor. The haulage gear case also is mounted in the body of the machine, and the chain-driving sprocket is driven from the same 70-hp motor through this year case. A fixed chain is used for the machine to haul itself along, and the machine is guided by the armored conveyor which carries the coal away.

Only one size of machine has so far been made, and is designed for seams 39 to 48 in thick. The machine travels quite fast and can cut some 500 yd of coal over 2 ft deep in a shift. The original face on which the machine was installed was 265 yd long.

Because of the rate of travel of the machine it was found that the withdrawal and resetting of supports tended to be a limiting factor on the speed of advance. Several experimental types of supports were used, including self-advancing hydraulic chocks. The first machine has given very promising results. An output of 12 tons per manshift has frequently been obtained.

Meetings Round-Up

Regional and National Groups Discuss Coal's Interests

IN THIS ISSUE, staff-written reports of five important industry meetings bring you concise information on what coal's leaders are thinking about, planning and doing right now. For up-to-date views of deep mining, stripping, preparation, safety and coal use, read:

43rd National Safety Council . . . . p 85
AIME-ASME Fuels Conference . . . p 88
Illinois Mining Institute . . . . . p 92
West Virginia-AIME Meeting . . . . . p 94
Kentucky Mining Institute . . . . . p 96

REHABILITATION, ROOF CONTROL (left photo)—Harry Gandy Jr. (left), National Coal Association; Nathaniel Kirk, Snow Hill Coal Corp.; W. J. Schuster, Hanna Coal Co., retiring chairman, Coal Mining Sec.; Miss Mary E. Switzer, Dept. of Health, Education and Welfare; and Dr. Warren F. Draper, UMWA Welfare and Retirement Fund.

DUST AND GAS CONTROL (right photo)—J. A. Stachura (left), Enoco Collieries, Inc.; L. H. Harrison, USBM; W. J. Schuster, Hanna Coal Co.; Irving Hartmann, USBM; and Wayne D. Snell, U.S. Steel Corp.

43rd National Safety Congress

Rehabilitation of physically handicapped, new shaft-sinking methods, changes in USBM test schedules and safety aspects in roof control, distributing electricity, and dust and gas control are major themes.

PROGRESS AND OPPORTUNITIES in finding gainful employment in industry for the physically handicapped, operational reports on the benefits of roof-bolting and wet rockdusting, a description of a new safer way of sinking shafts, a review of a proposed U. S. Bureau of Mines schedule for testing fire resistance of conveyor belting, and practical advice on protecting mine electrical circuits to prevent fires were highlights of the program at meetings of the Coal Mining Sec. of the National Safety Council at the council's 43rd annual meeting in Chicago, Ill., October 17-19.

Over 100 delegates representing coal producers, the United Mine Workers, state and federal agencies and equipment manufacturers also were brought up to date on the provisions of USBM Schedule 2F which supersedes Schedule 2E governing permissibility.

New section officers for 1956 were elected as follows:

Chairman—**F. J. Foresman,** director of industrial relations, Pittsburg & Midway Coal Mining Co., Pittsburg, Kan.

First vice chairman—**Charles R. Ferguson,** safety director, United Mine Workers of America, Washington, D. C.

Second vice chairman—**George H. Sambrook,** director of mine inspection, United States Steel Corp., Pittsburgh, Pa.

Secretary—**H. F. Weaver,** chief, coal mine inspection division, USBM, Washington, D. C.

Gil G. Grieve continues as staff representative of the National Safety Council to the Coal Mining Sec.

Speakers and their subjects at the Monday session were: **Dr. Warren F. Draper,** executive medical officer, UMWA Welfare and Retirement Fund, Washington, D. C., on the rehabilitation program of the fund; **Miss Mary E. Switzer,** director, Office of Vocational Rehabilitation, Dept. of Health, Education and Welfare, Washington, in formal discussion of Dr. Draper's remarks; **Harry Gandy Jr.,** director, Department of Safety, National Coal Association, Washington, on progress in the national campaign against roof-fall accidents, and

SHAFT, ELECTRICAL AND BELT SAFETY—S. P. Polack, USBM; F. J. Foresman, Pittsburg & Midway Coal Mining Co., chairman-elect of the Coal Mining Sec.; J. D. Reilly, Hanna Coal Co.; and L. W. Scott, General Electric Co.

Nathaniel Kirk, superintendent, Green Valley mine, Snow Hill Coal Corp., Terre Haute, Ind., on reductions in accidents and costs attributable to roof-bolting at Green Valley. **W. J. Schuster,** safety director, Hanna Coal Co., Div. Pittsburgh Consolidation Coal Co., Adena, Ohio, and retiring section chairman, presided.

AID FOR THE HANDICAPPED

Since 1948 the UMWA welfare fund has provided medical and hospital services for more than two million beneficiaries, including some 317,000 recipients of corrective treatments to overcome disability and restore individuals to fullest possible usefulness, Dr. Draper reported, in pointing out that among miners alone over 97,000 received such services. Of these, 6,500 were able to return to the mining industry, 15,500 found gainful work in other industries and 5,800 became self-employed.

Before receiving assistance, 1,113 miners spent their lives in bed, and now 1,041 of these men have been retrained in the common activities of daily living and are able to get around in wheel chairs or to walk, Dr. Draper said. Some 12,600 miners have been referred to vocational rehabilitation, and many, through co-operative arrangements, have been trained in new kinds of work. These retrained workers earned more than $5½ million in 1954.

Turning to the actual operations of the fund, Dr. Draper explained that it is extremely important to the patient and the fund to begin treatment as soon as possible. Early treatment has an important influence on the degree of recovery that may be obtained, the time required and the cost. The big task in the early days of operation was to seek out the patients requiring help, with district and local offices of the union providing most of the leads. However, in recent operations it has become more common for local physicians to refer patients to the fund and area offices also are on the alert for those in need of rehabilitation services.

Compensation agencies also are co-operating in arranging for early care of the seriously injured at special centers used by the fund, where excellent facilities and remarkable new techniques have been developed as a result of the number and types of patients received through the fund, Dr. Draper pointed out.

"Notwithstanding the determined efforts and progress that have been made in avoiding delay in providing adequate rehabilitation service to the patient," Dr. Draper declared, "we continue to find far too many instances in which the miner has been deprived of adequate care and treatment until his compensation benefits run out or it is finally decided to discharge him from the local hospital as hopeless. There are some physicians who are not yet aware of what can be done in the way of rehabilitation or are unwilling for other reasons to seek such services for their patients."

After describing the facilities employed by the fund, such as special centers, and aftercare clinics, Dr. Draper pointed out that various community agencies are in a position to help in rehabilitation. Their co-operation is actively sought by medical administrators of the fund.

In formal discussion of Dr. Draper's remarks, Miss Switzer brought out that 250,000 people are faced with a need for vocational rehabilitation every year and that only about 60,000 receive such service.

We have opportunity, money and know-how, making it mandatory for us to find and serve neglected disability, Miss Switzer declared, in pointing out that community action is needed. Right now there is a unified approach to the problem through the facilities of the fund, state departments of labor, the federal government and workmen's compensation plans, although in many instances these compensation plans must be modernized.

On the subject of whether lower pay scales might be possible for handicapped workers, Miss Switzer came out strong against both lower scales and sheltered jobs. The worker must be competitive in new kinds of work. Efforts must be made to accommodate the handicapped worker to his job and the job to the worker in order that he might become competitive.

FALTERING ROOF SAFETY

Reporting roof-fall prevention results ranging from mediocre to disappointing, Mr. Gandy, who is general chairman of the industry-wide campaign to prevent roof-fall accidents, pointed out that perhaps the promotion effort is not reaching the right people. Companies with good records are penalized when their records are statistically lumped with the records of companies run by non-interested parties. The general committee is wide open to any suggestions aimed at getting greater recognition of and compliance with the industry's campaign to materially reduce the toll of the No. 1 killer, roof falls.

Roof testing is important, but testing should not be used as an excuse for not supporting the roof. Many persons have been killed shortly after testing the roof and deeming it safe. In view of these occurrences, and the natural indeterminants in mine roof, the case for approved minimum standards for timbering or bolting looms larger in preventing roof-fall injuries or fatalities.

Making the campaign successful is not a 1-yr job, Mr. Gandy declared, in raising the hope that the groundwork laid by the general committee will provide stimulus and momentum for carrying on in the years immediately ahead.

IMPROVED SAFETY, LOWER COSTS THROUGH ROOF-BOLTING

Making a strong case for the safety advantages of roof-bolting, Mr. Kirk presented before and after data on Green Valley's compensable-injury experience revolving about the year 1953 when the mine was converted to 100% roof bolting in cycle with face operations. Figures for the years 1950 through the first 6 mo of 1955, inclusive, are as follows:

1950	
Total compensable accidents	21
Roof-fall compensable accidents	13
Tons per compensable accident	20,050
Tons per roof-fall compensable	32,389
1951	
Total compensable accidents	46
Roof-fall compensable accidents	19
Tons per compensable accident	11,538
Tons per roof-fall compensable	27,936
1952	
Total compensable accidents	31
Roof-fall compensable accidents	16
Tons per compensable accident	17,520
Tons per roof-fall compensable	33,946
1953	
Total compensable accidents	15
Roof-fall compensable accidents	5
Tons per compensable accident	53,588
Tons per roof-fall compensable	163,765
1954	
Total compensable accidents	13
Roof-fall compensable accidents	5
Tons per compensable accident	66,746
Tons per roof-fall compensable	175,540
First 6 mo. 1955	
Total compensable accidents	2
Roof-fall compensable accidents	0
Total production, tons	538,349

The mine employs 303 men and produces 4,400 tpd with five conventional units on two shifts. Prior to the change to roof-bolting—in 1952 when new management took over—a system of pin timbering with steel-rail bars on 3-ft centers was used on all motor roads. This permanent support was installed after the place had already been timbered during the face cycle, and it was expensive.

In side entries, the rails were set on legs on 3½-ft centers, and in rooms conventional timbers were installed on 4-ft centers. Excessive overtime was required on roof support, Mr. Kirk explained.

Now, 4-ft expansion-shell bolts are installed not over 4 ft apart at working faces immediately after the coal is loaded out. The mine consumes up to 1,500 bolts every operating day, and a bolting crew can install about 200 bolts per shift in many instances.

On the matter of costs, Mr. Kirk reported that in the biennium 1951-52, the combined cost of labor, supplies and compensation for conventional timbering was 68.04c per ton, and in the 1953-54 biennium, with roof-bolting, these costs were reduced to 54.04c per ton, a saving of 14¢ per ton. This traces back to increased production per man-shift, Mr. Kirk said, in pointing out that in 1951-52 average production was 2,687 tpd with an average payroll of 296 men, while in 1953-54 average production was 3,877 tpd with an average payroll of 278 men.

WET ROCKDUSTING IN CONTINUOUS-MINING CYCLE

Lead-off speaker at the Tuesday session was **Wayne D. Snell,** assistant director-mine inspection, Coal Operating Div., U. S. Steel Corp., Pittsburgh, Pa., on the use of wet rockdusting in the continuous-mining cycle. Other speakers were **Irving Hartmann,** chief, Dust Explosions Branch, USBM, Pittsburgh, on the effectiveness of wet rockdusting in preventing explosions; **John A. Stachura,** general superintendent, Enoco Collieries, Inc., Bruceville, Ind., on ventilation and methane-testing procedures at Enoco; and **L. H. Harrison,** mining-electrical engineer, USBM, Birmingham, Ala., on recent changes in the Bureau's schedule for testing face equipment. Mr. Schuster presided.

Noting that the coal industry now has machines that can advance more than 40 ft per shift in coal, Mr. Snell pointed out that some way had to be found to apply rock dust other than blowing it on dry to eliminate airborne dust which adversely affected visibility on the return side of the air current.

Accordingly, U. S. Steel went into an experimental program in co-operation with the Bureau of Mines, state departments of Kentucky and Pennsylvania and the Mine Safety Appliances Co. to determine how wet rock dust might be applied under actual operations in cycle with continuous mining. The work was carried out in U. S. Steel's Mine No. 32, at Lynch, Ky., and Leisenring No. 3, Uniontown, Pa.

Equipment includes an off-track Bantam rockdusting machine using 20 ft of

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2-in dusting hose and a ⅝-in water hose with 200 psi pressure on the line. Both hoses are attached to a rubber-lined nozzle 11 in long and 1½ in in diameter at the discharge end. Water flow is controlled by a gate valve connected to the nozzle.

As the airborne dust passes through the nozzle, a series of eight orifices in a water ring introduces a fine spray into the dust stream. It has been determined by test that the best mixture is obtained at 6.5 gal of water to 100 lb of rock dust.

At Lynch, with conventional mining, and at Leisenring, with continuous mining, the wet rock dust is applied to roof and ribs close up to the operating face units. Dry rock dust is applied to the floor merely opening bags on the floor and using shuttle-car drags to spread it in their normal travel.

The complete remarks of Mr. Snell and his test data are now being prepared for publication in an early issue of *Coal Age.*

WET ROCKDUSTING STUDIED

In view of the inconvenience and nuisance of dry rockdusting on shift, especially since continuous-mining methods make it possible to advance faces far beyond the 40-ft stipulation in multiple-shift work, the Bureau conducted investigations of the effectiveness of wet rockdusting at the experimental mine at Bruceton, Pa., Dr. Hartmann related, in pointing out that the objectives of the studies were to determine the best methods of applying the rock dust and to study its effectiveness in preventing propagation of explosions.

It was found that the best mixture is 6 gal of water to 100 lb of rock dust, when blowing the dry dust through a spray created at the nozzle, and that a minimum of 4 lb of wetted rock dust per linear foot of 7x10 entry was needed to adequately cover the ribs and roof. Furthermore, excess rock dust on ribs and roof apparently does not compensate for a deficiency of rock dust on the floor, indicating that if wet-dusting messes up the roadway then some means of spreading dry dust on the bottom must be worked into the cycle.

Small proportions of certain additives, including sodium bicarbonate, starch and French calcium carbonate, made limestone somewhat more dispersible after drying, Dr. Hartmann said, in suggesting that further study of the use of additives might be advisable.

A complete account of the bureau's tests on the effectiveness of wet rockdusting will be presented in a forthcoming Report of Investigations.

PROVIDING ADEQUATE AIR FOR CONTINUOUS MINING

"With continuous mining we find that areas that do not produce much methane can be handled much the same as conventional mining, with little or no curtain," Mr. Stachura said, "but in areas where gas is liberated, the problem becomes much more difficult."

The solution at Enoco, in developing a set of four entries, is to drive the intake entry at one side of the set from 18 to 20 ft. wide. A 10-ft-wide door is installed in this intake far enough outby the last open breakthrough to permit a Colmol, a pick-up loading machine and a shuttle car to work at the face with the door closed. The air passes around the door which extends across half the entry and is directed to the working face by a line brattice. All breakthroughs are turned from the intake and continued across to hole into the other three entries.

Doors are installed in the two center entries and in the breakthroughs between the two outer entries on the other side of the set to direct the flow of 10,000 cfm over the face machines. The Colmol is equipped with a curtain of its own which it carries into solid cuts, thus extending the effective length of the line curtain.

In room panels, in full-seam mining, bleeders are developed around gob areas, and in panels with 18 rooms on each side of the panel entries, Rooms 1 and 2, 9 and 10, and 17 and 18 are worked on both sides during panel-entry development to provide the bleeders for retreat operation. This means that while pillars are being recovered, the bleeders become returns and the four entries become intakes, thus eliminating all doors, Mr. Stachura explained.

Methane detection methods at Enoco include safety lamps in the hands of each equipment operator, with the Colmol operator having a copper tube leading from the head of the machine, through an aspirator bulb into the safety lamp which sets in a receptacle on the machine. Thus, frequent tests of the immediate face atmosphere may be made by the operator. If he detects methane, he stops the machine and clears the face.

An improvement has been the installation of a methane indicator on Colmols at a point about 8 ft from the face. The mechanism flashes a red light when methane builds up to 1%, Mr. Stachura said.

USBM REVISES PERMISSIBILITY REQUIREMENTS

The concluding speaker at the Tuesday session, Mr. Harrison, pointed out recent changes in the bureau's policy for testing electrical equipment and rendering approvals. One of the more important provisions revolves about the controversy on frame grounding of off-track equipment. The new schedule permits acceptance of certified devices that will disconnect power from the machine circuit in the event of a ground fault. The circuit in this regard is interpreted to mean all power and control circuits on the load side of a circuit breaker installed on the machine, as close to the source of power as is practicable. Such

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COAL RESERVES, GEOLOGY—A. T. Cross (left), coal geologist, West Virginia Geological Survey, Morgantown, W. Va.; Norman Schapiro, graduate student, West Virginia University, Morgantown, W. Va.; C. L. Potter, manager, coal and coke research division, Jones & Laughlin Steel Corp., Pittsburgh; James M. Schopf, supervising geologist, coal geology laboratory, USGS, Columbus, Ohio; Clayton G. Ball, president, Paul Weir Co., Chicago; and Charles H. Marks, project engineer, Bituminous Coal Research, Inc., Columbus, Ohio.

Solid Fuels For the Future AIME-

INDUSTRY MEETING—
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COAL RESERVES are ample to satisfy greatly increased demand. It is necessary to determine the distribution of petrographic constituents in some coal seams to guide mining and preparation methods. More and better fuel technologists will be needed in the future. And coal will be the source of liquid fuels in the near future. These were among the views expressed at the 18th annual Joint Solid Fuels Conference, sponsored by the Coal Division, AIME, and the Fuels Division, ASME, at Columbus, Ohio, October 19-21.

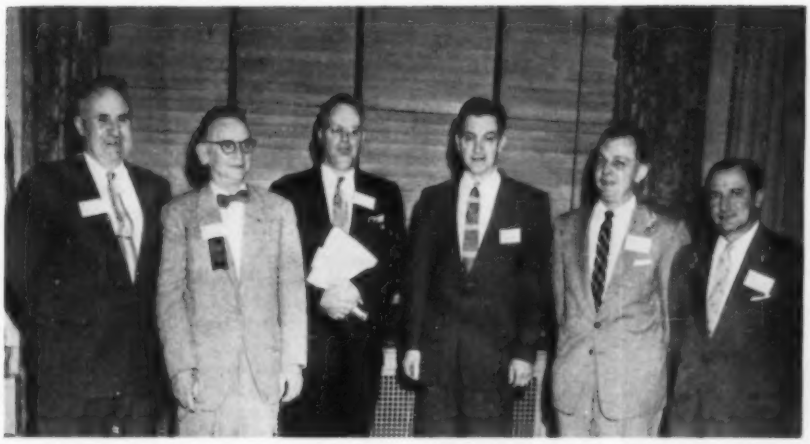
Other features of the program included presentation of the Percy Nicholls award for 1955 to Ralph M. Hardgrove, research division, Babcock & Wilcox Co., by Elmer R. Kaiser, director of research, American Society of Heating and Air-Conditioning Engineers, Inc.; luncheon talks by David R. Mitchell, secretary-treasurer, Coal Division, AIME; Carroll F. Hardy, Chairman, Fuels Division, ASME; and Ralph A. Sherman, technical director, Battelle Memorial Institute. Featured speaker at the Wednesday evening banquet was L. C. Campbell, president, National Coal Association, on coal, our national heritage.

At the opening session on Wednesday morning, Clayton G. Ball, president, Paul Weir Co., Chicago, discussed coal reserves of the United States for future use; James M. Schoff, supervising geologist, coal geology laboratory, USGS, Columbus, Ohio, described petrographic methods for application to solid fuels of the future; and Aureal T. Cross, coal geologist and paleobotanist, West Virginia Geological Survey, described the relation of petrographic structure to utilization of solid fuels of the future. Norman Schapiro, graduate student, West Virginia University, Morgantown, was co-author with Mr. Cross. Co-chairmen of the opening session were C. L. Potter, manager, coal and coke research division, Jones & Laughlin Steel Corp., Pittsburgh, and Charles H. Marks, project engineer, Bituminous Coal Research, Inc., Columbus, Ohio.

OPPORTUNITIES FOR TECHNOLOGISTS, STOKER DESIGN—Frank G. Smith, president, The Sunday Creek Coal Co., Columbus, Ohio; T. S. Spicer, professor, fuel technology, Pennsylvania State University, University Park, Pa.; W. S. Major, project engineer, machinery division, Dravo Corp., Pittsburgh; and Earle C. Miller, research engineer, Riley Stoker Corp., Worcester, Mass.

COAL RESERVES

The most comprehensive information on national coal reserves has been assembled by the U. S. Geological Survey, Mr. Ball reported. The most recent country-wide summary of coal resources by the USGS are Circular 94, published Nov. 1, 1950, and Circular 293, dated Oct. 1, 1953. Total reserves of all ranks of coal were 2.4 trillion tons in 1950 and 1.9 trillion tons in 1953. Reduction from a total estimated reserve of 3.1 trillion tons before 1950 was primarily a result of reappraisals of reserves in Colorado, Georgia, Indiana, Maryland, Michigan, Montana, New Mexico, North



PREPARATION, SINTERING, LIGNITE—Harold E. Rowen, general manager, Dwight-Lloyd Div., McDowell Co., Inc., Cleveland; H. F. Yancey, chief, division of solid fuels technology, Region I, USBM, Seattle, Wash.; E. P. Carman, chemical engineer, USBM, Washington; Walter L. Hartman, assistant director, physical plant, Ohio State University, Columbus, Ohio; J. A. Glunt, steel works metallurgist, Cleveland Works, J & L Steel Corp.; J. R. Dawson, chief chemist, Vesta-Shanopin Coal Div., J & L Steel Corp.; and R. L Sutherland, research consultant, Truax-Traer Coal Co., Chicago.

ASME Fuels Conference Theme

Carolina, North Dakota, South Dakota, Virginia and Wyoming. A further reduction resulted from using estimates compiled by State Geological Surveys rather than those compiled previously by the USGS in Illinois, Kansas, Missouri, Pennsylvania and West Virginia, Mr. Ball explained.

The reserves represent coal in place, generally with a minimum thickness of 14 in for anthracite and bituminous, 30 in for subbituminous and lignite, and at a depth of less than 3,000 ft. Since 1950, the USGS has estimated recoverable reserves as 50% of reserve in place. Thus, the current total of recoverable reserves of all ranks in the United States is 950 billlion tons. However, this sum is not final since additional studies are in progress in Alabama, Kentucky and Oklahoma, Mr. Ball noted.

Bituminous reserves make up 55% of the total, with 36% occurring in the Appalachian area, 20% in the Eastern Interior and 28% in the Far Western area. Most of the lignite is found in North and South Dakota, Montana, Texas and Arkansas. Subbituminous is found mainly in the Rocky Mountain province and immediately east. About 32% of the total reserves lie east of the Mississippi River and consist entirely of bituminous and some anthracite, while nearly 68%, including lignite and subbituminous coal are west of the Mississippi, Mr. Ball declared.

Coal reserves are ample to satisfy even greatly increased demand. However, any large increases in production from producing fields will cause a rapid transition of mining into new districts or to adjoining areas of probably inferior characteristics. This will come about rapidly enough to impel the consumers to analyze very carefully the locations of their probable coal supply, Mr. Ball emphasized.

PETROGRAPHY AND UTILIZATION

Textural differences which affect the physical behavior of coal influence the choice of the petrological methods for study. The thin-section method usually is preferred for studying coal constituents, but the coal rank also is important in choosing a method, Mr. Schopf declared.

Petrological methods may be used in many ways for a variety of applications in the future. Best results, however, are obtained when they are combined with other methods, Mr. Schopf declared.

The position of the various components within a coal bed is highly important in using petrological methods. One of the most difficult problems is in making a distinction between the various components in a coal. Many practical problems in blending, coking and hydrogenation may be solved easier with the aid of petrological methods, Mr. Schopf said.

It is necessary to determine the original distribution of petrographic constituents in some coal seams to guide selective mining and cleaning methods. Research indicates that this information, together with control studies of similar preparations of broken coal following cleaning, may result in increased plant efficiency, uniformity of blends and prediction of physical reactions not evident by chemical tests alone, Mr. Cross declared.

One of the biggest problems in understanding the petrographic analyses prepared by various laboratories and combining the results for practical use stems from the many sets of standards, classifications and terminology. Potential industrial users of the information are not greatly interested in names so long as they know to what they refer.

Blending of coking coals depends partly on petrographic character. But much more basic research and experience are needed before petrographic studies will provide a suitable short cut to developing coking blends and improving quality control, Mr. Cross added.

Modern cleaning plants can use petrographic qualities of coals in practical ways. There is evidence of segregation or enrichment of certain constituents in various size fractions. If this knowledge can be put to work, cleaning plants can do more than remove refuse. Coals of different qualities may be segregated for different uses, thus permitting better use of the coal and making available larger quantities with special properties for coking, gasification, hydrogenation and chemical industries, Mr. Cross concluded.

At the Wednesday afternoon session, T. S. Spicer, professor, fuel technology, Pennsylvania State University, University Park, Pa., spoke on the need and opportunities for fuel technologists in the coal industry. Earle C. Miller, research engineer, Riley Stoker Corp., Worcester, Mass., discussed future trends in stoker design, and Howard E. Nelson, conveyor engineer, Jeffrey Mfg. Co., Columbus, Ohio, gave an illustrated talk on trends in coal handling for electric power stations. Co-chairmen of the session were W. S. Major, project engineer, machinery division, Dravo Corp., Pittsburgh, and Frank G. Smith, president, The Sunday Creek Coal Co., Columbus, Ohio.

(Continued on next page)

SYNTHETIC FUELS, DUAL-FUEL FIRING—John H. Melvin, chief, division of geological survey, Ohio Dept. of Natural Resources, Columbus, Ohio; H. R. Batchelder, consulting chemical engineer, Battelle Memorial Institute; Harlan W. Nelson, chief, fuels technology division, Battelle Memorial Institute; Leroy F. Deming, head power generating section, Bureau of Yards and Docks, U. S. Navy; and C. H. Sawyer, research engineer, Coal Div., Eastern Gas & Fuel Associates, Pittsburgh.

PERCY NICHOLLS AWARD—Ralph M. Hardgrove (left), research division, Babcock & Wilcox Co., receives award for outstanding service in the solid-fuels field, from Elmer R. Kaiser.

TECHNOLOGISTS NEEDED

To match the rapid pace of industry with its keen competition, the coal industry will need more and better trained fuel engineers and technologists. Other industries are spending more for research and the coal industry will be forced to do likewise. Thus more jobs will be available in this field. Mining companies hire fuel technologists as salesmen, engineers, research chemists and for quality control. As a result of keen competition among the coal companies, the fuel technologist will be used more and more in sales jobs, Mr. Spicer said.

The electric utilities and the lime, cement and glass industries have learned that fuel technologists make excellent plant foremen and superintendents. Manufacturers of combustion and steam-generating equipment require many new graduates. The chemical and by-product industry has always used many fuel technologists, Mr. Spicer added.

New trends have created opportunities for fuel technologists. Instrument and control companies hire them as service men and salesmen. Large coal consumers are beginning to find employment of fuel technologists as purchasing agents profitable, Mr. Spicer said.

There are excellent opportunities in the coal industry for the young technologist. However, we are not producing enough. The coal industry has not taken any concerted action about the shortage. But it can meet the challenge by inducing young people to enter the coal industry either by offering financial aid or other consideration, Mr. Spicer declared.

FUTURE STOKER DESIGN

Ash-removal equipment will become standard with small stokers as its advantage is becoming recognized and appreciated. Automatic ash-handling equipment combined with a self-cleaning grate operating with fully automatic control makes constant attention to small stoker-fired plants obsolete. In the future, ash disposal and coal supply will go hand in hand and will be done by the supplier rather than the user, Mr. Miller remarked.

To compete with oil units, completely automatic self-cleaning stokers must be made available at reasonable cost for smaller plants. There also is a definite trend toward improved grate surfaces both in material and design. These improvements will increase grate life and improve fuel-bed conditions. Ignition safeguards, automatic-bank operation and control over a wider load range also will be incorporated in new stokers, Mr. Miller declared.

Much work has been done in engineering package units for solid fuels. Boiler and stoker are shop-assembled and tested before shipment. The trend in small units is toward a completely shop-assembled boiler and stoker equipped with full controls and accessories. This type package saves time and cuts the cost of installation.

Stoker accessories also will be designed for longer life, lower maintenance and less attention. Fuel specifications will continue to be critical.

The new hopper-fed oscillating grate probably will partially displace the single-retort underfeed stoker in 2,000- to 10,000-lb units because of the self-cleaning feature. Self-cleaning spreader stokers and the water-cooled vibrating-grate stokers will dominate the 10,000- to 100,000-lb field, but chain- and traveling-grate units will continue to be used. The traveling-grate spreader stoker will continue popular and increase its hold in the 100,000- to 200,000-lb class while moving up into the larger units as the drop in fuel quality puts a greater handicap on pulverizing, Mr. Miller concluded.

At the Thursday morning session, J. A. Glunt, steel works metallurgist, Cleveland Works, Jones & Laughlin Steel Corp., described coal preparation at J&L Vesta mines. J. R. Dawson, chief chemist, Vesta-Shanopin Coal Div., was co-author. Harold E. Rowen, general manager, Dwight-Lloyd Div. McDowell Co., Inc., spoke on solid fuels and the Dwight-Lloyd sintering process. E. P. Carman, chemical engineer, USBM, Washington, read a paper on pulverizing lignite in a bowl mill, by R. C. Ellman, supervising chemical engineer, USBM, Grand Forks, N. Dakota. High-moisture lignite as a fuel for steam generation, present and future, was discussed by R. L. Sutherland, research consultant, Truax-Traer Coal Co., Chicago. H. F. Yancey, chief, division of solid fuels technology, Region I, USBM, Seattle, and Walter L. Hartman, assistant director, physical plant, Ohio State University, Columbus, were co-chairmen.

COAL PREPARATION

Modern preparation facilities were needed when J&L changed from hand-loading to full-seam mining at its Vesta

mines. Selective mining was first practiced but proved unsatisfactory because refuse disposal became a problem at the mill and too much coal was lost in selective mining. As a result, management decided to build a plant that could process the full seam, including 14 to 16 in of draw rock. Between 1947 and 1950, a total of $14 million was spent on the plant, and other improvements later brought the total to $21 million, Mr. Glunt said.

In brief, the cleaning process is as follows:

Raw coal with up to 35% reject is delivered to a double-track rotary dump for initial blending. Plus 8-in is removed on a bar screen, crushed and recombined with the 8x0 which flows to a 200-ton hopper. From there raw coal is carried across the river by belt conveyor to the preparation plant. A belt tripper distributes the coal to a 500-ton storage bin.

Sixteen vibrators screen the raw coal into 8x¼ and ¼x0 fractions for delivery to the cleaning facilities. Coarse-coal cleaning is done in two stages in HMS vessels at 1.55 and 1.35, with a middling product being recovered for steam generation. Fine coal is also cleaned in two stages by Rheolaveur launders and Deister tables. Final moisture reduction is done by Carpenter driers. Other plant features include cyclones, thickeners and heated screens.

Operating results show that raw coal with 30% ash is upgraded to a product with 7% ash and 1.40% sulphur. There is less than 1% float in the refuse and less than 1% sink in the clean coal from the heavy media unit cleaning at 1.55. At the 1.35 gravity in the second unit, there is 1% sink in the clean metallurgical-coal fraction and 50% float in the refuse of the steam-coal product. There is less than 2% sink in the clean launder product, while there is 10% float in the refuse, Mr. Glunt said.

FUELS AND SINTERING

Ores suitable for Dwight-Lloyd sintering first had their fuel closely associated with the metallics. However, as the value of the process to remove volatiles and get the desired agglomeration became apparent, experiments were made to find the best fuel. Many fuels were tried but fine solid-carbon fuels were most successful. When these fuels are finely sized and thoroughly mixed with the ore charge, their full value is seen, Mr. Rowen declared.

Trouble in getting the desired fuel can only result in the prospective customer turning to research to find a way of achieving his objective by methods which do not require fuel. This will result in loss of markets for solid fuels, Mr. Rowen warned.

Many freshly mined clays and shales and waste materials from other processes may be sintered by the Dwight-Lloyd process to produce a superior lightweight aggregate. This process competes with kilns fired by oil or gas. A little help from coal and coke producers in making proper grades of fuel available can make more sales possible, Mr. Rowen declared.

Pelletizing of low-grade iron ores on a sintering machine or traveling-grate-type equipment requires coal or coke. But the grade and sizing must be right and the fuel must be available or the competitive kilns, shaft furnaces and the like, which can use other fuels, will take the business elsewhere.

Sintered fly ash from burning pulverized coal is an excellent cinder-like aggregate for use in the building trades. One eastern utility reports that fly-ash disposal cost is 10% of the cost of using coal, and that once they can establish a fly-ash sintering plant their coal usage will increase markedly. It costs an average of about 75c a ton to dispose of fly ash and the value of turning this costly operation into a profitable one cannot be ignored, Mr. Rowen said.

LIGNITE

In presenting Mr. Ellman's paper on pulverizing lignite in a bowl mill, Mr. Carman described results of tests made at the W. J. Neal station, Central Power Electric Co-operative, Voltaire, N. Dak. Power consumption, fineness and moisture content of the mill product, along with other operating characteristics, were shown for various feed rates. Moisture in the lignite feed ranged from 38.0 to 43.6%. The cost of pulverizing lignite exceeds that for higher rank coals because of the lower heat value of the lignite, Mr. Carman said.

High-moisture lignite from North Dakota is burned successfully in the following: (1) forced-draft traveling-grate stokers equipped with non-sifting grates and using preheated air; and (2) spreader stokers or stationary and dumping grates or reverse-traveling grates in units up to 250,000 lb of steam per hr and with unit pulverizers at capacities up to 230,000 lb. It has been burned experimentally in a steam generator equipped with a cyclone furnace at capacities up to 170,000 lb per hr. Pulverized lignite is burned in units of 800,000 lb in Texas, Mr. Sutherland said.

The overfeed principle of combustion is used exclusively in industrial stoker-fired units. Furnace designs for steam generators using lignite as a fuel are nearly the same as those designed for higher-rank coals. However, for maximum efficiency, heat release rates per square foot of grate and per cubic foot of furnace volume are slightly lower than for higher-rank coal. Abrupt changes in load are met satisfactorily.

Preparation and sizing methods are about the same as for higher-rank Midwestern coals used in the same type firing equipment. The high moisture content presents no serious problems in preparation, storage or handling, Mr. Sutherland declared.

At the Thursday afternoon session, the future of synthetic liquid and gaseous fuels was discussed by H. R. Batchelder, consulting chemical engineer, Battelle Memorial Institute. Harlow W. Nelson, chief of the Fuels Technology Div. of Battelle, was co-author. Navy practice of designing for dual-fuel firing in shore-station steam plants was described by Leroy F. Deming, head, Power Generating Sec., Bureau of Yards and Docks U. S. Navy, Washington. C. H. Sawyer, research engineer, Coal Div., Eastern Gas & Fuel Associates, Pittsburgh, and John H. Melvin, chief, Div. of Geological Survey, Ohio Dept. of Natural Resources, Columbus, Ohio, were co-chairmen of the session.

SYNTHETIC FUELS FUTURE

The rate of growth of energy demand, particularly for liquid and gaseous fuels, the supply and availability of natural fuels, and the logistics of the probable future circumstances are factors that will determine the production of synthetics almost without regard to present price structure. There has been a five-fold increase in the volume of goods and services turned out in the first 50 yr of this century by a labor force that was little more than doubled. However, the supply of energy increased nearly five-fold to meet the needs of the expanding economy, Mr. Batchelder said.

Population growth has more than met earlier expectations. Since 1946, the rate of growth has shown a rather sharp increase, and by May, 1955, the population had reached 165 million. This total was expected in 1960. By 1975, the Census estimates a population of 210 million. This projected growth means that more energy than was estimated even a few years ago will be required in the future to maintain the standard of economy, Mr. Batchelder declared.

A projection of the total energy-demand curve, based on the average rate of growth per capita usage from 1920 to 1952, shows a projected demand of 57,000 trillion Btu for 1975. This represents a 47% increase over the supply in 1952. One report lists a possible total demand of 2,600 million short tons of bituminous coal equivalent by 1975, Mr. Batchelder remarked.

Future energy from atomic power plants, estimated by the AEC to reach 83 million kw by 1975,, will supply about 2.5% of the total by 1975, or nearly the same quantity produced in 1952 by water power. Therefore, even with a generous forecast of development of atomic power, it cannot noticeably alter the overall energy picture within the next 25 yr, Mr. Batchelder emphasized.

Our total energy demands are now at such a high level that development of any new source, such as solar energy, must proceed a long way before its contribution to the total is of real significance. It does not seem reasonable, therefore, that use of solar energy, even though it grows rapidly, can rise to major proportions in the next 20 yr, Mr. Batchelder declared.

Domestic production of liquid fuels since shortly after World War II has lagged behind demand and imports have been needed to make up the deficit. By 1975, a total demand of 14.6 million bbl per day is projected. Production of domestic crude probably will reach a peak around 1965, and then gradually decline.

(*Continued on p. 148*)

IMI OFFICERS (left photo)—George M. Wilson (left), Illinois Geological Survey, secretary-treasurer; F. Earle Snarr, Freeman Coal Mining Corp., president-elect; J. W. MacDonald, Old Ben Coal Corp., retiring president; and Paul Halbersleben, Sahara Coal Co., Inc., vice president-elect. **SAFETY TRAINING, STRIPPING** (right photo)—Tony Shimkus (left), Peabody Coal Co., session chairman; J. D. Reilly, Hanna Coal Co., Div. Pittsburgh Consolidation Coal Co.; and Murrell Reak, Illinois Dept. of Mines & Minerals.

Belt Design, Preparation, Stripping, Continuous Mining Major Topics as . . .

Illinois Mining Institute Meets

INDUSTRY MEETING—A Special COAL AGE Staff-Written Report

IN AN INFORMATION-PACKED ONE-DAY MEETING of the Illinois Mining Institute at Sprigfield, Ill., Oct. 28, nearly 500 registrants heard an explanation of the factors involved in belt design, a description of equipment and circuits in the new Freeman No. 4 preparation plant, a rating of atomic energy as a competitor of coal, and salient facts on the operation and maintenance of four different types of continuous-mining machines. Other features of the program were a summary of striking developments in stripping in the eastern states, and a progress report on safety training in Illinois mines.

In a short business meeting at the morning session, the institute elected officers and directors, as follows:

President—**F. Earle Snarr,** vice president in charge of operations, Freeman Coal Mining Corp., Chicago, Ill.

Vice President—**Paul Halbersleben,** general superintendent, Sahara Coal Co., Inc., Harrisburg, Ill.

Secretary-treasurer—**George M. Wilson,** head, Education Extension Div., Illinois Geological Survey, Urbana, Ill., re-elected.

Directors—**Frank Nugent,** executive vice president, Freeman Coal Mining Corp., Chicago; **W. C. Campbell,** assistant to vice president—operations, Old Ben Coal Corp., West Frankfort, Ill.; **Dr. T. A. Reed,** head, Dept. of Mining and Metallurgical Engineering, University of Illinois, Champaign-Urbana, Ill.; **Byron Somers,** superintendent, Red Ember mine, Truax-Traer Coal Co., Fiatt, Ill.; **J. P. Weir,** vice president, Paul Weir Co., Chicago; and **Merle Kelce,** president, Key Coal Co., Kansas City, Mo.

Taking steps to increase interest in mining engineering education, the directors of the institute raised the IMI scholarship at the University of Illinois from $200 to $400 a year, authorized a similar scholarship at the Missouri School of Mines; and considered the advisability of producing a film on the activities of mining engineers for showing in high schools and elsewhere.

In other reports on mining engineering education, Dean Everett, University of Illinois, pointed out the need for and value of intense interest on the part of the industry in insuring proper training facilities in the colleges. M. D. Cooper, director, mining engineering education, National Coal Association, stated that all in the industry must spread accurate information on coal mining. There is a distorted view abroad, but most students and teachers are genuinely interested. NCA folders on the subject are available for distribution to science teachers and students, Mr. Cooper said.

Speakers at the morning technical session were: **James Adams Jr.,** chief engineer, research and development, Raybestos-Manhattan, Inc., Passaic, N. J., on balanced design of conveyor belts; **Emery Milligan,** preparation engineer, Freeman Coal Mining Corp., Marion, Ill., on latest developments in preparation at Freeman No. 4; and **Arthur S. Griswold,** assistant to the president, Detroit Edison Co., Detroit, Mich., on atomic energy as a competitor to coal. **Ward Padgett,** general superintendent, Bell & Zoller Coal Co., Johnston City, Ill., was session chairman.

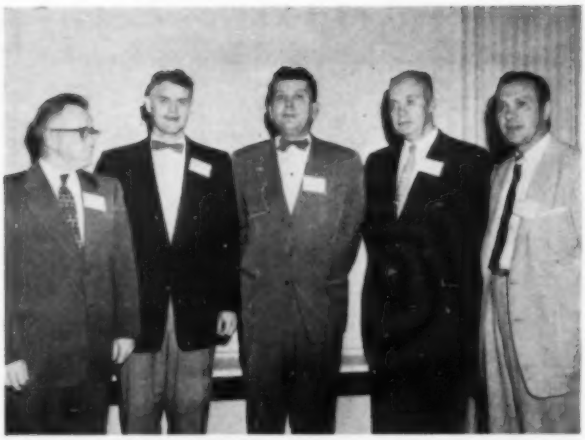
DESIGNING BETTER BELTS

Other factors besides drawbar strength alone have direct bearing on the length of useful life in a conveyor belt, Mr. Adams explained, while showing slides of laboratory units designed to test belt failure at various speeds and tensions and under strenuous loading conditions. For example, relative motion between belt plies and belt cover must be taken into account since the plies take different stresses in passing over pulleys. And these stresses are quickly reversed where a snub pulley is empolyed, making the strength and resiliency of the outer plies a critical point of study by designers.

One solution to this problem has been the development of "compensated-fabric" design, in which the outer plies are stress-relieved by initially loading the inner plies to a higher value while the belt is being made and by matching ply materials of varying yield resistance in one belt.

Small snub pulleys are hard on belts, Mr. Adams said, in explaining that a wrap of as little as 20 deg on the snub pulley is enough to develop full stresses in the plies.

On the matter of belt selection, Mr. Adams showed that while thinner belts are more flexible, thicker belts usually show better adhesion of rubber to fabric because of looser weaving.



CONTINUOUS MINING—C. C. Conway (left), Clarkson Mfg. Co.; O. D. McDaniel Jr., Old Ben Coal Corp.; Mr. Shimkus, session chairman; Frank Eubanks, Old Ben Coal Corp.; and J. A. Stachura, Enoco Collieries, Inc.

BELTS, PREPARATION, ATOMIC ENERGY—A. S. Griswold (left), Detroit Edison Co.; James Adams Jr., Raybestos-Manhattan, Inc.; Emery Milligan, Freeman Coal Mining Corp.; and C. W. Padgett, Bell & Zoller Coal Co., chairman.

CLEANING FREEMAN COAL

Washing 6x1 and 1x¼ in separate 9-ft Dutch State Mines heavy-media vessels, first such vessels in the United States, is an outstanding feature of the new preparation plant at Freeman No. 4 mine, Marion, Ill., Mr. Milligan said, in presenting a word and motion-picture description of his company's new facility. After 5 mo of operation the heavy-media vessels have proved to be low in maintenance and high in magnetite economy, using about 0.5 lb per ton of feed. Medium recovery equipment for the vessels includes two classifier cyclones, a Jeffrey drum-type magnetic separator and a Dorr thickener.

The ¼x0 fraction of the 500 tph feed to the plant is cleaned in two Roberts & Schaefer SuperAirflow cleaners. Rejects of the heavy-media vessels and the air tables are fed into a two-cell, five-compartment Jeffrey jig, both reject elevators of the jig discharging directly to final refuse.

Product of the jig is screened into 6x⅞ and ⅞x0 fractions. The 6x⅞ is reduced in an American crusher to minus ⅞ in and returned to the jig for rewashing. The ⅞x10-M is loaded directly, and 10Mx0 is collected in a settling tank and then dewatered for disposal.

Features of the Dutch State Mines shallow-trough washer, Mr. Milligan said, include a stable bath, thus eliminating a medium-recirculation system. Also, the machine is relatively simple and able to absorb wide variations in load without affecting the clean coal. Furthermore, the unit is equipped with automatic density control, using the difference in pressure in two diptubes of different lengths to actuate the magnetite-feeding equipment.

Included in Mr. Milligan's presentation was a 17-min motion picture covering the plant from feed to loading, which was co-operatively produced by Freeman Coal Mining Corp. and Roberts & Schaefer.

THE ATOM—COMPETITOR?

In the 10 yr since the power-producing potentialities of atomic energy first cropped up, progress has been extremely rapid, Mr. Griswold stated. Several plants now are in construction, and exuberant press reports tell of large-scale contributions to be made by atomic energy in providing the Nation's power.

Taking an objective look from his position in the power-generating industry, Mr. Griswold reported that Detroit Edison will burn about 5 million tons of coal in 1955 and expects to continue increasing its coal burn in the years immediately ahead. Atomic-energy plants will not supplant the modern coal-fired facilities now being built with expectations of from 20 to 30 yr of operation.

The gap between the investment required for an atomic-energy plant and that required for one using conventional fuels still is a big obstacle. The investment in the atomic plant at Shippingport, Pa., will be about $850 per kw of capacity, about half of this in development. On the other hand, the cost of a new Detroit Edison plant, designed to use conventional fuels, will be about $165 per kw of capacity. It is expected the new plant will require only 9,500 Btu per kw-hr produced.

Turning to the five major atomic plants now approved for construction by the AEC, Mr. Griswold noted that all are of different types and are to be built with the aim of securing operational and economic data as much as for any other reason. Much work is to be done before these become an operating reality. The power companies must participate in these studies because they cannot pass up without serious study any possibility that might lead to cheaper power.

In regard to the effects of all this on coal, Mr. Griswold showed that by 1963 major atomic projects will have a capacity of about 680,000 kw or 4½ to 5 billion kw-hr per yr, a coal equivalent of 2 million tons per yr. The power industry now has a capacity of 102 million kw (beginning of 1955), and by the end of 1958 will have a capacity of 141½ million kw. Most of this expansion will be based on conventional fuels. The coal burn by utilities in 1958 should be about 170 million tons and in 1962, about 180 million tons, Mr. Griswold said to the Institute audience.

Taking a longer look, Mr. Griswold reported an estimate of Walker Cisler, president, Detroit Edison, to the effect that atomic energy in 1975 will contribute from 40 to 65 million kw, which will be less than 25% of the nation's power needs.

In the meantime, the cost of power from conventional fuels should continue to decrease as a result of higher burning efficiency and lower labor costs in the new plants. And in the final analysis, atomic energy may be a real boon to coal in supplying heat to permit the economical conversion of coal into oil, Mr. Griswold concluded.

At the afternoon session, program highlights were a review of eastern stripping by **J. D. Reilly**, vice president, Hanna Coal Co., Div. Pittsburgh Consolidation Coal Co., St. Clairsville, Ohio; a report on safety training progress in Illinois by **Murrell Reak**, assistant director, Illinois Dept. of Mines & Minerals, Springfield; and a panel discussion on operation and maintenance of various types of continuous-mining machines. Panel members were **C. C. Conway**, mining engineer, Clarkson Mfg. Co., Nashville, Ill.; **O. D. McDaniel Jr.**, production engineer, and **Frank Eubanks**, maintenance engineer, Old Ben Coal Corp., West Frankfort, Ill.; **J. A. Stachura**, general superintendent, Enoco Collieries, Inc., Bruceville, Ind.; and **Stephen Canonico**, president, Compass Coal Co., Philippi, W. Va. Session chairman was **Tony Shimkus**, superintendent, Mine No. 17, Peabody Coal Co., Pana, Ill.

(*Continued on p 152*)

CORE DRILLING, CORROSION—W. A. Haslam (left), The New River Co., session chairman; J. F. Mason Jr., International Nickel Co.; and Wendell L. Reich, Reich Bros. Mfg. Co.

COAL AND COMPETITION—J. J. Foster (left), Island Creek Coal Co., session chairman; E. K. Newman, International Harvester Co., co-chairman; and Walter H. Voskuil, Illinois State Geological Survey.

Coal Mining and Marketing Feature W. Va.—Central Appalachian Meet

TWO MAJOR THEMES characterized the technical sessions on coal at the joint- annual meeting of Central Appalachian Sec., AIME, and the West Virginia Coal Mining Institute, at the Greenbrier, White Sulphur Springs, W. Va., Nov. 11-12. They were: (1) mining safely and efficiently and (2) coal's market future.

Officers were announced and elected at the business sessions as follows:

Chairman, Central Appalachian Sec.: **Rhesa M. Allen,** French Coal Co., Bluefield, W. Va., succeeding **George O. Tarleton,** president, Consolidation Coal Co. (Ky.), Div. Pittsburgh Consolidation Coal Co.

Vice Chairmen: **F. M. Morris,** Clinchfield Coal Corp.; **H. O. Zimmerman,** Inland Steel Co.; and **E. H. Greenwald,** Boone County Coal Corp.

Executive Committeemen: **R. H. Hughes,** Clinchfield Coal Corp.; **A. D. Sisk,** Kentucky Dept. of Mines & Minerals; and Mr. Tarleton.

Secretary-Treasurer: **Charles T. Holland,** head, Department of Mining Engineering, Virginia Polytechnic Institute, Blacksburg, Va.

President, West Virginia Coal Mining Institute: **C. E. Hough,** Norton Coal Co., Elkins, W. Va., succeeding **Roland C. Luther,** executive vice president, Peerless Coal & Coke Co., Bluefield, W. Va.

Vice Presidents: **C. R. Nailler,** Christopher Coal Co., Div. Pittsburgh Consolidation Coal Co.; **George McCaa,** Jamison Coal & Coke Co.; **R. Glenn Lazzell,** Island Creek Coal Co.; **S. D. Brady Jr.,** Baltimore & Ohio R. R.; and

INDUSTRY MEETING— A Special COAL AGE Staff-Written Report

H. G. Kennedy, Kanawha Coal Operators' Association.

Executive Board: **C. R. Bourland,** The New River Co.; **James F. Trotter,** Trotter Coal Co.; **Arch Alexander; Harry Quenon,** Eastern Gas & Fuel Associates; and Mr. Luther.

Secretary-Treasurer: **G. R. Spindler,** head, school of mines, West Virginia University, Morgantown, W. Va.

COAL FUTURE—J. E. Tobey, president, Appalachian Coals, Inc., with George O. Tarleton, Consol of Ky., toastmaster.

Presiding officers at the coal sessions were: **William A. Haslam,** The New River Co., Mt. Hope, W. Va.; **Mr. Tarleton; John J. Foster,** Island Creek Coal Co., Huntington, W. Va., with **E. K. Newman,** International Harvester Co., Benham, Ky., as co-chairman; and **George A. Judy,** Consolidation Coal Co. (W. Va.), Div. Pittsburgh Consolidation Coal Co., Fairmont, W. Va., with Mr. Brady as co-chairman.

AIR CORE DRILLING

In discussing new developments in air rotary drilling and coring, Wendell L. Reich, Reich Bros. Mfg. Co., Terre Haute, Ind., noted that his company started after the war with a wet-type prospecting unit. It was then asked to design a blast-hole drill to make a 9-in hole and in developing the machine, started using air as the circulating medium. Next, it built what is still the largest blasthole drill in the world, with a 100-ft mast mounted on crawlers and using 700 hp to drive all the machinery.

Further work in drilling problems and techniques, Mr. Reich continued, resulted in a decision to try air with a conventional diamond core bit and barrel. With air for diamond drilling, control of down pressure in the bit becomes more delicate, leading to the use of the lever-type machine to permit "floating the drill stem down." Various diamond bits and core barrels were tried with not too much success in soft material until Sprague & Henwood provided a bottom-discharge

WEST VIRGINIA OFFICERS—C. E. Hough (left), Norton Coal Co., new president; R. C. Luther, Peerless Coal & Coke Co., retiring president; and G. R. Spindler, W. Va. School of Mines, re-elected secretary-treasurer.

BELT FIRES, MINER DESIGN, AIR SURVEYS—George A. Judy (left), Consol of W. Va.; J. L. Thornton, Goodyear Tire & Rubber Co.; Spencer Bowman, Cleveland Rock Drill Div.; T. W. Howard, The New River Co.

bit that did not permit air circulation around the core. "With this combination, we were able to get 100% core recovery almost every time, even stopping halfway through a coal seam and getting full recovery to that point."

The bottom of the hole must be kept clean and casing, therefore, usually is set. If a small volume of water is present, it sometimes will stick to the outside of the core barrel and prevent proper removal of the cuttings, Mr. Reich noted. It usually can be cleared up by pouring 2 or 3 gal of water down the hole and allowing the air to blow everything clean.

"After obtaining the proper bit and core barrel, we have taken dozens of cores in succession with 100% core recovery. In soft, friable coal, we find that at least a 4x5½-in core barrel is necessary. If smaller, the core has a tendency to break and fall out easily.

"We find that pressures from 1,000 to 5,000 lb may be applied to a 4x5½-in diamond bit in solid coal if applied steadily without any jumping or surging, and speeds of penetration will be from ½ to 1 fpm. We normally rotate the barrel at 120 rpm, and use approximately 100 cfm of air at 20 psi. The very small annular space around the core barrel prevents a larger volume of air because the pressure would increase considerably and resultant damage to the core would be undesirable.

"One main advantage of air coring is that parting lines of clay, etc., are not washed out as they would be when using water. Of course, it is obvious that doing away with water and mud pits is another great advantage."

CORROSION PREVENTION

Noting that corrosion engineering emerged as a professional branch about 15 yr ago, J. F. Mason Jr., Corrosion Engineering Sec., International Nickel Co., reviewed fundamentals and ways and means of eliminating or arresting corrosion. Corrosion, he observed, is basically an electrochemical reaction and the purer the metal the less the effect. A basic preventive method is providing a substitute, of which the most popular form is the anode. Current from a selenium rectifier may be impressed on a tank or line to break up the usual galvanic flow. It follows that using different materials as close in the galvanic scale as possible helps.

Other preventive or alleviative methods include films of various types, including certain rust films formed on the metal itself, the use of inhibitors in materials handled, changing the environment of the metal, metal purification and metal alloying. Nickel alone or in an alloy, such as one of the forms of stainless steel, keeps corrosion to zero or a minimum figure, and for certain critical applications is well worth the extra cost. As an example of benefits, Mr. Mason noted that in a conveyor trough ⅜-in tank steel handled only 325,000 tons, whereas a nickel-copper steel handled 1,258,000 tons. Low-alloy steels, he noted, rust, and the rust acts as a protective film. This makes them especially suitable where paint is used, since even if the paint fails rust will form and prevent destruction.

COAL'S FUTURE

"Coal's future can be greater than its past. Its past was great because it put the breath of life into American industry and nurtured its growing muscles," said J. E. Tobey, president, Appalachian Coals, Inc., Cincinnati, in exploring "The Road Ahead for Coal."

Stressing particularly the advent of nuclear power, and the efforts being made by government and private industry to develop it as rapidly as possible, Mr. Tobey noted that substantial production still is some years away. What about the economics? "For nonmilitary uses, economics and the geographical location of the reserves of conventional fuels must be considered jointly when thinking in terms of the application and use of nuclear power." Some notions remote from conventional fuels might justify nuclear power at 30 mills or even more per kwhr, but it could be justified in the United States at not over 2½ to 3 mills.

"The criterion for the development of nuclear power for any nation should be based upon its specific need for that power." In the United States, it is plainly evident that the public, for the most part, is unaware that there is coal availabel for centuries to come. This fact has a major bearing on any fuels policy Congress is called upon to consider, and especially on any proposal to subsidize nuclear-power development. Data on reserves "should convince any responsible person that no urgency exists for the subsidized development of nuclear power in this country and that its growth should be a natural one."

Continuing, Mr. Tobey noted that "Now, assuming for the moment that nuclear power will be a fair competitor when it comes and that it will be allowed to fit into the energy pattern in a normal fashion, as did oil and gas, the road ahead for coal has many attractive possibilities." To realize these to the utmost, "Responsible producers must be constantly alert to all market and demand changes, and change their methods of mining and preparation accordingly, keep production in balance, cost at a minimum, and the sizing and preparation of their products in step with the demands of the market." Above all, "it is tremendously important at this time that the coal industry publicly and repeatedly declare the key position which it occupies in the economic life and freedom of this nation. The public does not have the facts. The government-congressional and executive —needs them."

(Continued on p 150)

Kentucky Mining Institute Holds 16th Annual Meet

Safety, AC mine power, belt controls, and mobile belt conveyors are spotlight topics.

MINING under high-pressure gas lines, the Akremite blasting process, use of AC current with face equipment, work measurement and supervision incentives, safe controls for belts, fire-resistant belts, mobile-belt conveyors, applying and sampling rock dust, wet rock dusting in the mining cycle, the coal mine safety act and fires and explosions in Kentucky in 1955 were major topics at the sixteenth annual meeting of the Kentucky Mining Institute at Lexington, Nov. 10 and 11.

Herman E. Knight, mining engineer, Madisonville, was elected president, succeeding S. A. Fox, general manager of northern mines, Blue Diamond Coal Co., who presided over the meeting. Session chairmen were: Mr. Knight; J. T. Reams, Clear Fork Coal Co.; Frank Smith, general superintendent, Blue Diamond Coal Co.; D. F. Crickmer, Osborne Coal Sales Co.; William Crawford, general manager, Princess Elkhorn Coal Co.; and Norman Yarborough, chief engineer, Lynch Div., U. S. Steel Corp.

Robert Dickson, director of safety, Kentucky River Mining Institute, served as master of ceremonies at the banquet on Thursday and Robert W. Wilson, Kentucky Utilities, was speaker. Awards were presented to the state mine rescue champions, who are also national champions, and the state first-aid champions.

Members of the champion mine-rescue team from Consolidation Coal Co. (Ky.) are Douglas Damron, captain; William

(Continued on p 145)

New Officers Kentucky Mining Institute

President—H. E. Knight, mining engineer, Madisonville.

Vice Presidents—Frank Smith, general superintendent, Blue Diamond Coal Co., Leatherwood; E. F. Milem, Store; and Norman Yarborough, chief engineer, Lynch Div., U. S. Steel Corp., Lynch.

Secretary-Treasurer—A. D. Sisk, chief, Department of Mines & Minerals, Lexington.

Directors—J. H. Graham, superintendent, Jewell Ridge Coal Co., Tilford; L. A. Hopper, president, Greenridge Coal Co., Allois, Ky.; S. A. Fox, general manager of northern mines, Blue Diamond Coal Co., Middlesboro; C. J. Barton, general manager, Kentucky Ridge Coal Co., Fields; G. M. Patterson, vice president, West Kentucky Coal Co., Madisonville; Bradley Sparks, general manager, W. G. Duncan Coal Co., Greenville; D. F. Crickmer, Osborne Coal Sales Co., South Williamson; H. B. Jones, general manager, Eastern Coal Corp., Stone. Harry Zimmerman, manager coal properties, Inland Steel Co., Wheelwright, William Crawford, vice president and general manager, Princess Elkhorn Coal Co., David; Lawrence Bassham, general manager, Harlan-Wallins Coal Corp., Verda; and B. W. Whitfield III, vice president, Harlan Collieries Co., Brookside.

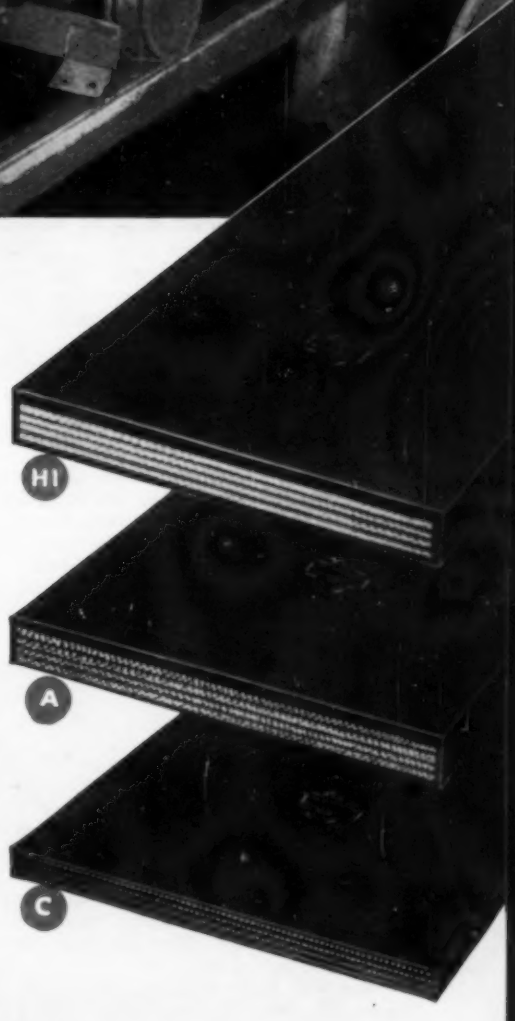
AC EQUIPMENT, gas lines over mineral deposits, Akremite blasting, work measurement and incentives—W. H. Roll, mining engineer, Department of Mines & Minerals; L. H. Harrison, electrical engineer, USBM; S. A. Fox, general manager, northern mines, Blue Diamond Coal Co., Fred W. Gesling, civil engineer; Frank Forsyth, electrical engineer, Department of Mines & Minerals; J. T. Reams, president, Clear Fork Coal Co.; Sid N. Gay, sales manager, Spencer Chemical Co.; Herman E. Knight, mining engineer; Theodore M. Barry, Theodore M. Barry & Associates; and John Stachura, general superintendent, Enoco Collieries, Inc.

BELT CONTROLS, fire resistant belts, mobile belts, rock dusting—seated: Frank Smith, superintendent, Blue Diamond Coal Co.; Guy Browning, Robinson & Robinson; and D. F. Crickmer, Osborne Coal Sales Co. Standing: Dr. Irvin Hartmann, physicist, USBM; Wayne Snell, assistant director, mine inspection, U. S. Steel Corp.; S. P. Polack, health and safety engineer, USBM; and William Hanson, Joy Mfg. Co.

Thermoid Conveyor Belting cuts handling costs on rugged mining jobs

There's a Thermoid Conveyor Belt designed to lower your handling costs on every mining job. Here are three examples: HI —For extremely abrasive materials such as coal, granite, trap rock, flint rock, quartz ore; A —For slag, lime rock, crushed stone and other highly abrasive materials; C —For moderate abrasives such as sand, loam, soda, gravel.

Thermoid's exclusive impregnation process welds carcass and cover into an exceptionally strong, durable belt. Finest quality reinforcement and specially compounded rubber stocks assure long life . . . lower your handling costs per ton. Your Thermoid Distributor carries a complete line of Thermoid Conveyor Belting, Multi-V Belts and Hose to meet the most severe requirements of any mining operation. Call him or write direct for full information.



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FOREMEN'S FORUM

Getting Standard Performance

KNOWING HOW LONG it should take to make a round trip from loading machine to discharge station will help in keeping the cycle in balance.

Supervisor's first step is to determine reasonable average time required for each production job . . . Then take action in advance to make sure these standard times are observed

WE RECENTLY HAD THE PLEASURE of visiting again the operating offices of the Peabody Coal Co. at Taylorville, Ill., where Joe Craggs, field superintendent, planted the seed of an idea that could grow into a useful supervisory technique for you. Mr. Craggs gives to each of his unit foremen a booklet having space for on-the-job notes and containing human relations hints, safety reminders and tips on how to get at least average performance out of the units.

For example, the booklet points out clearly how many minutes should be required to load a shuttle car at the face, then follows with suggestions for keeping within this average time, all keyed to conditions at Peabody's own properties.

Let's look into this by selecting some commonly-encountered elements in production cycles and working up some suggestions for controlling the time required for such duties.

You will have to know an average acceptable time for the various operations. Your best source of such information will be time-study records which you can secure through your mine foreman or superintendent from the engineering department of your company. For purposes of illustration, we will use some time-study data and performance averages we have here at hand.

Here are some examples of jobs to be done, with hints to supervisors for getting them done:

Standard Performance—A 5-ton shuttle car, served by a conventional loading machine, can be loaded in about 4 min.

Getting Standard Performance—With loading machines capable of picking up and discharging a ton of coal in from 0.6 to 0.8 min, fastest shuttle-car loading calls for the following actions:

1. Minimum maneuvering of the loader while the shuttle car is under the boom. Straightaway advances into the pile of coal at the face are alright, but side-to-side searching for coal is the kind of maneuvering that should be done while the loader is waiting for the next shuttle car to come up.

2. Never forcing the loading machine to dig out tight coal while a car is waiting to be loaded. In fact, a loading machine is not designed for digging. Therefore, if tight coal is encountered cut after cut, you should examine your face-preparation procedures.

3. Keeping cables and water lines out of the way to permit shuttle cars to come in under the boom without delay and to get away fast.

4. Being alert to any slowdown resulting from a low voltage. If you can't clear the difficulty quickly, report it to your superior as soon as you can.

5. Trying to have services performed as much as possible in the time it takes for one car to leave the loader and the other to arrive under the boom. Did you know this car-change time, with the loader ready and able to load, can amount to as much as 30% of total shift time, using two cars on a 350-ft haul? Try to get service value out of that time.

Standard Performance—Barring bad local conditions, 15 cuts per shift (kerf and single shear) in 14-ft-wide places is about par for a two-man crew using a universal machine with an 8-ft cutting bar.

Getting Standard Performance—At some mines, not particularly blessed by nature, cutting crews consistently score up to 20 cuts per shift by:

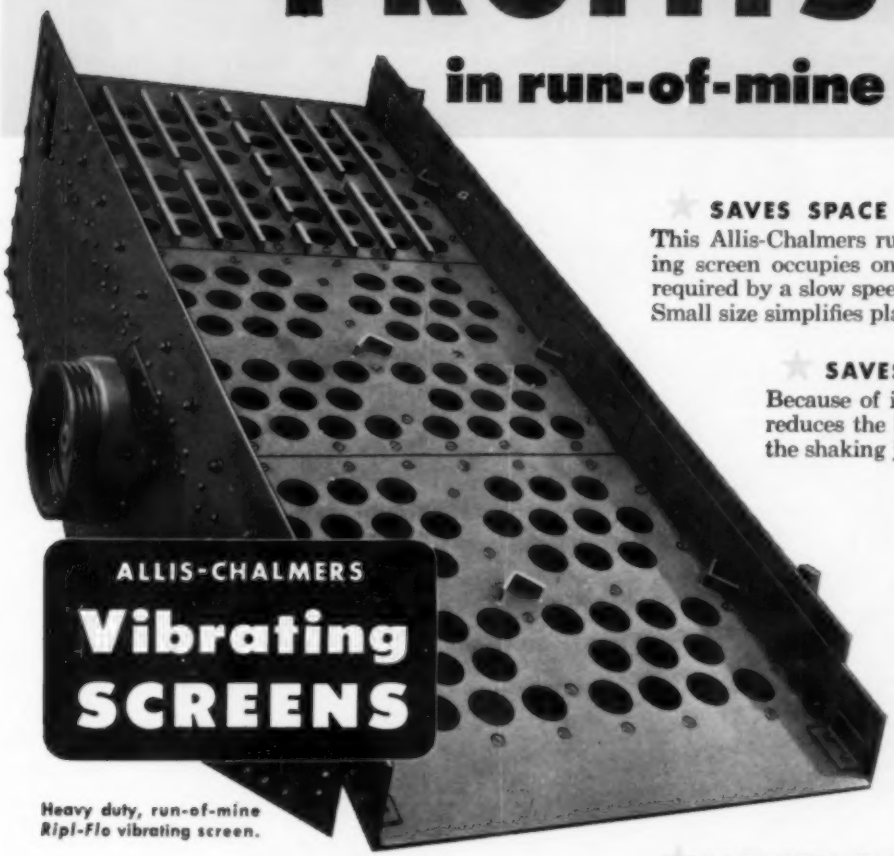
1. Sensing quickly, through experience and the reactions of the cutting machine, that a change of bits is necessary. Dull bits waste time and power, two expensive commodities in mechanized mining.

2. Storing tools and cutting supplies, such as spare bits, spray nozzles, bit wrenches, extra chain links and pins and so on, right on the machine where they can be had in a hurry. The supervisor should keep an eye on the inventory of these items on the machine.

3. Working up a regular duty roster on

SAVINGS that build PROFITS

in run-of-mine scalping



Heavy duty, run-of-mine *Ripl-Flo* vibrating screen.

SAVES SPACE

This Allis-Chalmers run-of-mine *Ripl-Flo* vibrating screen occupies only a fraction of the space required by a slow speed shaker of equal capacity. Small size simplifies plant layout and saves space.

SAVES HORSEPOWER

Because of its smaller size, this screen reduces the horsepower required to do the shaking job by approximately 50%.

SAVES MAINTENANCE

The heavy duty run-of-mine *Ripl-Flo* screen has a simplified two-bearing construction. Fewer parts mean fewer replacements and less time out for repairs. Oil-lubricated mechanism requires little attention. Your production time is increased . . . your maintenance time is reduced.

PROMOTES PLANT EFFICIENCY, TOO

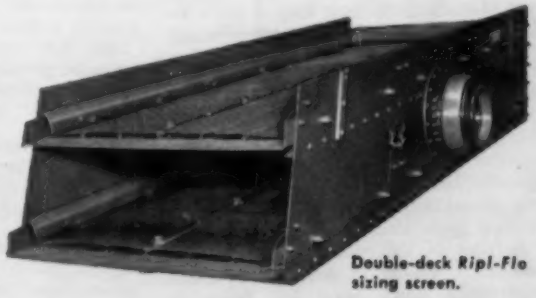
Recovery of egg, nut, stove, and stoker sizes can be increased as much as 4% when these heavy duty screens are used to remove 7x0, 6x0 and 5x0 coal ahead of rotary breakers.

For complete information, see your nearby A-C representative or write Allis-Chalmers, Milwaukee 1, Wisconsin, for Bulletin 07B7868.

Egg, Nut, Stove, and Stoker Sizing

The wide range of standard heavy duty *Ripl-Flo* vibrating screen sizes meets every sizing application. These screens can also be supplied with *Sta-Kleen* decks and electrically heated decks for screening fine moist coal.

An A-C Screen for Every Phase of Coal Preparation — scalping and dry sizing, wet sizing and dewatering. A-C screens are applied following such equipment as jigs, sand cones, chloride washers. They're used in heavy density plants for pre-wetting and media recovery, as filter screens for recovery of fines and water clarification.



Double-deck *Ripl-Flo* sizing screen.

Ripl-Flo and *Sta-Kleen* are Allis-Chalmers trademarks.

ALLIS-CHALMERS

A-C ALLIS-CHALMERS

A-4662

taking dull bits to the shop for regrinding and bringing repaired bits into the section. This may eliminate the possibility of suffering through a substandard shift because of slow cutting.

Standard Performance — Two-man roof-bolting crews, using modern twin-boom bolting machines, are setting up to 80 bolts per man.

Getting Standard Performance—Some crews regularly place 150 bolts per shift, some have placed 200 when all the breaks were favorable. It can be done by:

1. Preassembling bolts as much as possible. Even if the bolts come into the section knocked down, there usually is some time in which a number of assemblies can be made up—while waiting for the loading machine to leave a place, for example.

2. Changing bits as soon as the drilling time per hole exceeds 30 sec, if that is the normal time required in your section.

3. Anticipating the bolting crew's need for supplies and keeping such supplies up close to the face. Some of the waiting time of your shuttle cars can be applied to this useful duty.

4. Examining the bolting cycle in an effort to eliminate excessive maneuvering or interference between crew members.

5. Looking into the possibility of having the loading crew leave safety jacks in place for the bolting crew.

These three examples have been selected to show how a unit foreman may go about his job of establishing standard time for each element in his cycle, and following through to see that the standard times are met. Having this information on paper or firmly in mind and consciously trying to achieve standard performance every day provide the best opportunities for taking the breathlessness out of the foreman's job.

If formal time-study figures are not available, which may be the case in a brand new mine or a small operation, the foreman may work up figures for his own guidance, as follows:

Take a position at the shuttle-car discharge station for a few minutes each day. Jot the arrival times of the two cars over a period involving several trips of each. Note how long it takes to discharge the load when no troubles are encountered. Collect data on a number of trips to arrive at a reasonable average standard time.

Take similar notes at the face while observing the operations of the loading machine. The standard times you work up will become "second nature" with you, permitting you to sense an out-of-balance cycle after some practice.

Purpose of the system is to eliminate luck as a factor in production. Good supervisors don't hope for favorable breaks. They make them by taking hold of their jobs through devices like these.

Last but not least, enthusiasm among the men in your crew is a big factor in keeping on schedule. At efficient mines, stressing effective human relations as well as intelligent application of machines, this enthusiasm is quite evident. You can see it in the number of new ideas developed at such mines.

Remember This?

Perhaps you recognize this illustration. It was used originally in our September, 1955, issue in an article describing the activities of the Indiana Joint Safety Committee. This regional safety-promotion group conducted an intense pre-Christmas safety campaign last year in Indiana's deep mines, with the result that in December no fatalities nor serious injuries marred the holiday season for the men and their families.

We think it might serve as a useful reminder to every unit foreman in the industry. Take a moment with your crew or with each of your men to warn them that preoccupation in the approaching holidays must not permit them to shrug off their big stake in safety. Bad roof and other hazards recognize no holidays. You and your men can't afford to relax in counteracting these hazards.

Don't spend your White Christmas in a hospital. Make that your theme for the next few weeks.

A Worried Mind

THE YOUNG PRESIDENT'S ORGANIZATION is a group of executives who became presidents of their concerns before reaching 40 yr of age. Their companies employ 50 people or more and annual sales volume of each company is $1 million or more.

You would imagine that sharp young fellows like these would exude extreme confidence and knife through their daily work in a most direct manner.

But they, too, have misgivings. Their ten most pressing worries, according to a survey by Science Research Associates, are:

1. Using time effectively. Most young presidents complain that they have more work to do and more people to see than they can handle.

2. Not being a doer. Most difficult adjustment is the shift from being a person who accomplishes work to one who gets things done through others.

3. Building a team. Finding, training and motivating key men is a thorny problem.

4. Setting the direction. Defining and re-analyzing the factors that produced success in their companies is a source of mental anguish.

5. Finding expert advice. Lack of such help, either because the firm cannot afford such advice, or because the president has not recognized the explicit need for it, sometimes results in serious errors.

6. Securing working capital. At one time or another nearly every young president (there are 950 in the organization) worries about his company's lack of adequate working capital.

7. Making crisis decisions. A recurring worry is the necessity for the president to act as chief fireman for his company whenever a crisis arises. (However, at such times they prove why they became presidents in the first place.)

8. Negotiations. Another burden that adds anxiety is bargaining of one kind or another.

9. Searching for a creed. The president wants a code of ethics that will distinguish between a good businessman and one who is unscrupulous.

10. Self-improvement. Three out of four are currently engaged in some type of training to improve themselves as businessmen.

Sound familiar? It appears that a characteristic of those who reach the top is a reluctance to announce that they have "arrived." Everybody has problems; there is room for improvement, always.

GM DIESEL
CASE HISTORY No. 556-188

OWNER: Badgett Mine Stripping Corporation, Madisonville, Ky.

INSTALLATION: GM "6-110" Diesel-powered Bucyrus-Erie 3-yard shovel loading fleet of GM Diesel-powered Euclid rear dumps on Pennsylvania Turnpike extension project.

PERFORMANCE: Partner Brown Badgett says GM Diesels are "doing a wonderful job." He's running his shovel 10 hours a day, plans to start 24-hour operation soon.

"Doing a Wonderful Job"

FEW WOULD expect to find a mine-stripping contractor on a road-building job. However, where there's dirt and rock to be moved in a hurry it is *not* unusual to find a General Motors Diesel-powered excavator. The faster, livelier crowd and swing of a "Jimmy" powered shovel means more yards per day at a lower cost per yard.

Principal reason for this snappy action is that a GM 2-cycle Diesel delivers power on *every* piston downstroke—not on every *other* downstroke as in 4-cycle engines. That means faster acceleration, instant response to throttle demands, real "go" when the bucket takes a bite.

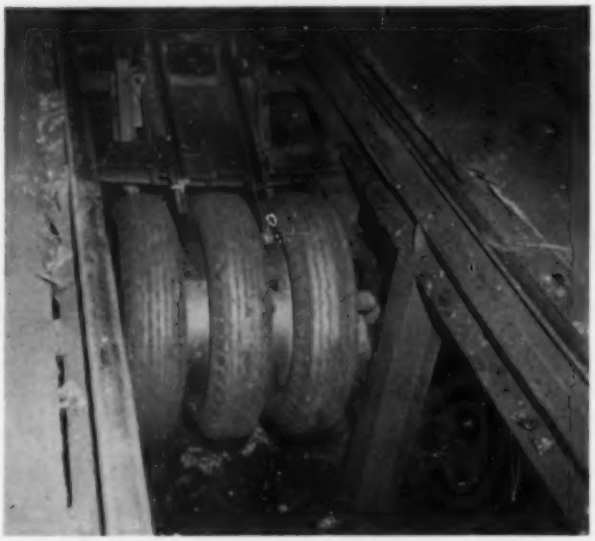
And a GM Diesel costs less to maintain, too. Valves cost up to 62% less, cylinder liners cost up to 40% less, than similar parts for other Diesels.

More than 150 different manufacturers pick GM Diesel power for over 850 different models of equipment they build. Your GM Diesel distributor can give you the list plus full information on GM Diesel engines. See him today or write direct.

DETROIT DIESEL
ENGINE DIVISION OF GENERAL MOTORS
America's Largest Builder of Diesel Engines
Single Engines . . . 30 to 300 H. P. Multiple Units . . Up to 893 H.P.

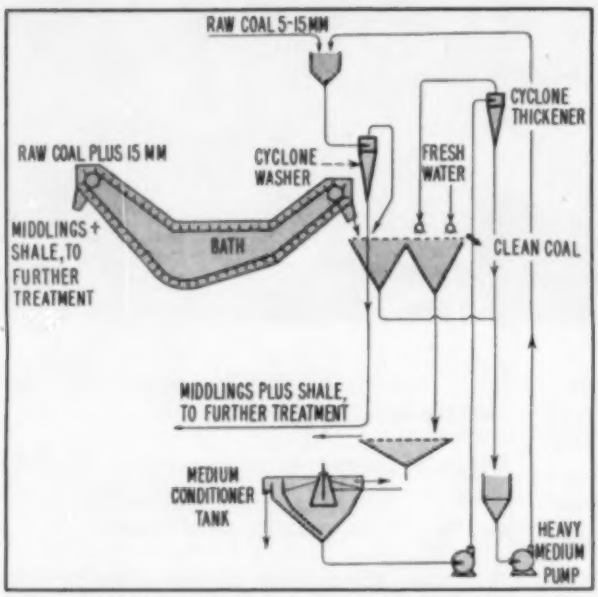
GM
GENERAL MOTORS
DIESEL POWER

OPERATING IDEAS



Tires Cushion Car Doors

TO REDUCE DAMAGE to car doors on dropbottom units this reclosing device was substituted for the conventional reclosing units at the Buckhorn mine of the Bell & Zoller Coal Co., Johnston City, Ill. As the empty cars are pulled to the end of the underground bin, the doors strike the tires and are closed with a minimum of shock. Three old 8:25x20 truck tires were fitted snugly around a drum which is fastened to a shaft that turns freely in bearing supports. Door maintenance has been considerably less since the reclosing device has been in service, management reports.



CYCLONE WASHER cleans fine coal in a new Netherlands washery.

Washing Fine Coal In Cyclones

RECENT IMPROVEMENTS in cyclone washing, made by engineers of Dutch State Mines, include application of a low-pressure cyclone washer, a reduction in the amount of rinsing water, simplification of the magnetic recovery system for the dilute magnetite suspension and a reduction in the number of vibrators and magnetic separators, according to an article in the Oct. 21, 1955, issue of *Iron and Coal Trades Review*.

In smaller cyclones operating at high pressure the influence of gravity may be neglected, but in larger, low-pressure cyclones the force of gravity plays an important part. In the latter, a suspension layer immediately adjacent to the airfilled core leaves the cyclone at the apex by gravity. Since this layer contains light coal particles, the result is misplaced material in the coal and in the reject.

In the case of a nominal 20-in cyclone, this occurs when the feed pressure drops to about 22 to 32 ft of head. However, if the cyclone is placed in a nearly horizontal position, the high-pressure flow pattern is restored and coal no longer shows up in the reject. With the cyclone in this position excellent separations can be made with head pressures as low as 13 ft, the article says.

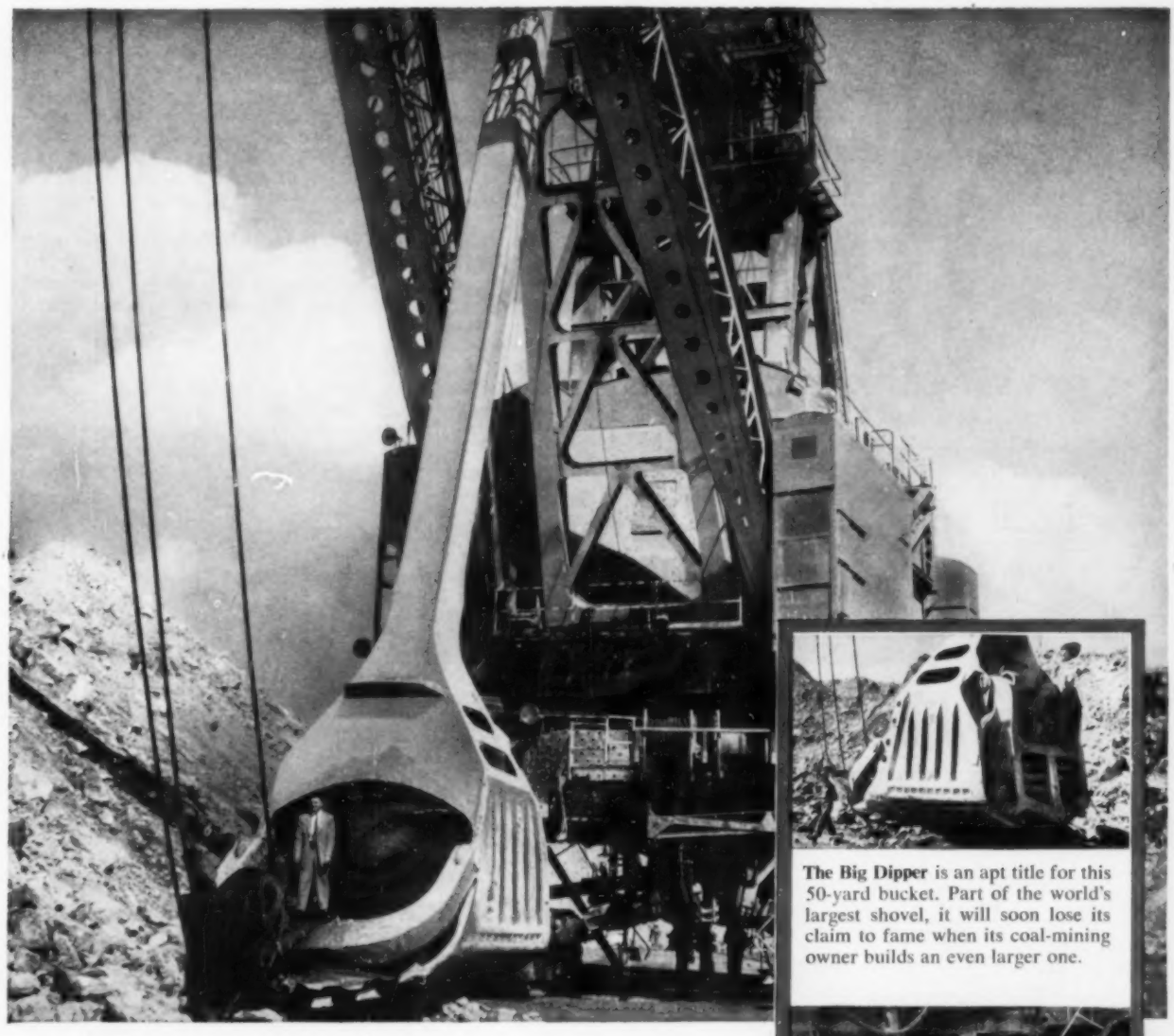
Capacity of an installation like this is about 50 tph, raw deslimed slack. Low-pressure operation permits simplification of plant layout and reduces cyclone wear and power consumption.

Originally, the amount of rinsing water used on cyclone products was about 1,400 gal per ton of raw feed, but after careful study of the rinsing operation it was found that the water requirements could be reduced by half or more, thus reducing the amount of energy required, the size of the thickener and magnetic-separator capacity in the reclamation circuit.

Minus 12-mm slack is most suitable for treatment in cyclone washers, although coal as large as 25 mm may be handled in a 20-in unit without blockage at the apex.

At the Emma washery in the Netherlands, plus 15-mm coal is washed at 1.5 sp gr to produce domestic fuel at about 5% ash. The 5x15-mm coal is industrial fuel and should be washed at 1.7 sp gr to make a product of 7% ash.

By bringing all this coal, 150 tph, into one bath at 1.5 sp gr, a fraction of the 5x15-mm coal is lost. The loss is too small to warrant the use of two baths and it is desired to use slime tailings as medium. With such a medium, however, a separation at 1.7 is impossible. Therefore it was decided to install a cyclone washer operating at 1.7 with the same medium. The bath and cyclone washer are served by a single recovery system. In cleaning finer sizes, down to 0.5 mm, say, magnetite is a preferred medium.



The Big Dipper is an apt title for this 50-yard bucket. Part of the world's largest shovel, it will soon lose its claim to fame when its coal-mining owner builds an even larger one.

Quiet, Cities Service at Work! In the mammoth gears beneath the shovel, Cities Service Trojan L Compounds give outstanding lubrication. They were chosen by the owner for all mechanized equipment.

Even the Trucks are Giants! Each big Euclid carries a 60-ton payload. Gear failure would be extremely costly. But that's no problem with Trojan L Compounds for lubrication.

Find the Cities Service Lubrication Engineer

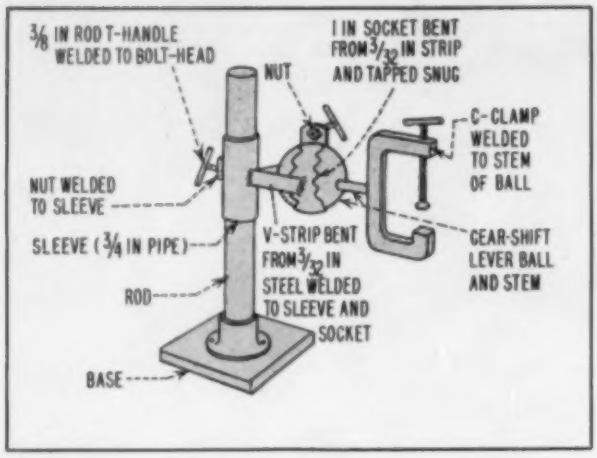
Henry Zielasko, the Cities Service Lubrication Engineer in this picture, may look small, but he's no drop in the bucket in the operation of the world's largest shovel.

The reason: Henry supplies the gear lubricants—Cities Service Trojan L Compounds—for *all* the equipment owned by this giant mining company. And, to get the job, his Cities Service lubricants had to prove their superiority in rigid tests against those of every major competitor.

Henry, and the many other skilled Cities Service Engineers like him, are prepared to prove the merits of themselves and their products to you in the same manner. Put them to the test! Call your nearest Cities Service office, or write: Cities Service Oil Co., Sixty Wall Tower, New York 5, N. Y.

CITIES SERVICE

QUALITY PETROLEUM PRODUCTS


3/8 IN ROD T-HANDLE WELDED TO BOLT-HEAD
NUT
1 IN SOCKET BENT FROM 3/32 IN STRIP AND TAPPED SNUG
C-CLAMP WELDED TO STEM OF BALL
NUT WELDED TO SLEEVE
SLEEVE (3/4 IN PIPE)
V-STRIP BENT FROM 3/32 IN STEEL WELDED TO SLEEVE AND SOCKET
GEAR-SHIFT LEVER BALL AND STEM
ROD
BASE

Positioning Jig Made From Scrap

EASIER AND FASTER welding is possible with the help of a welding jig. Scrap material is all you need to make this handy shop aid, according to an operating kink in the October issue of Linde *Tips*. Here is how the jig is made.

There are five main parts: clamp, universal joint, sleeve, rod and base. The clamp is an ordinary C-clamp. The universal joint can be made in the shop from an old gear-shift lever with a ball on the end and a strip of metal.

To make the socket for the ball, cut a strip of 1-in metal from 3/32-in material. You can get the right length for the strip easily by wrapping a strip of paper around the middle of the ball. Cut the strip of metal this same length and then cut notches in the strip with a hacksaw and file. Drill a 3/8-in hole in each end. Bend the strip around the ball. Put a washer between the holes and put a 3/8-in bolt through them. Tap the strip around the ball until it fits snugly, then tighten the bolt. Put the assembly in a vise and bend the points to fit the ball. Now weld the nut to the strip. Weld a T-handle made of 3/8-in rod to the bolt. The socket is now completed and it will grip the ball firmly when the bolt is tightened.

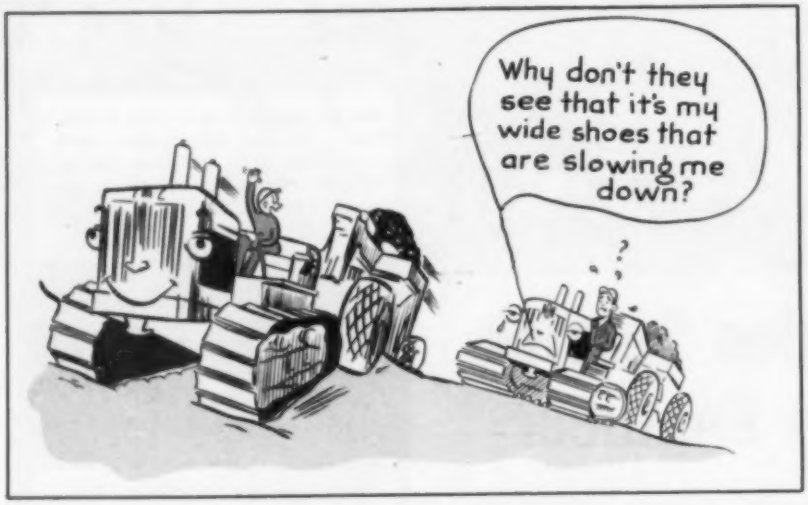
To make the sleeve, drill a hole in a short piece of 3/4-in pipe. Then screw a nut on a bolt and put the bolt through the hole in the pipe, screwing it into a nut that is placed inside the pipe. Now weld the outer nut to the pipe and remove the inner nut. Weld a T-handle onto the bolt.

Any strong straight rod that fits inside the sleeve will do as an upright support.

The base can be small, for clamping to a work bench, or large and heavy enough to prevent tipping.

To assemble the jig, connect the rod to the base and slip the sleeve over the rod and tighten it. For connecting the socket to the sleeve, bend a V from a strip of 3/32-in steel. Weld the apex of the V to the sleeve, opposite the nut, and weld the ends of the V to the sides of the socket.

Now weld the C-clamp to the stem of the ball and the jig is completed.



Proper-Size Shoes Improve Tractor Performance

THE RIGHT TRACK SHOE for the job conditions is mighty important in getting the best performance from a crawler tractor. The biggest mistake is "over-shoeing" a tractor. Track shoes that are too wide for the kind of work or for job conditions reduce track life, maneuverability and speed.

Three factors which must be considered in selecting track shoes for a wide range of operating conditions, according to the International Harvester Co., are: (1) flotation, or ground pressure; (2) pull-bracing grouser area, and (3) track-wear life.

An easy way to determine ground pressure is by dividing the tractor weight in pounds by the number of square inches of track area resting on the ground. The track area can be figured by doubling the track-shoe width and multiplying the result by the distance in inches between the center lines of the drive sprocket and the front idler.

Sometimes ground pressure is overemphasized and such wide shoes are used that the weight of the tractor isn't enough to push the grousers fully into the ground. As a result, the area of the grousers that penetrate the ground and help pull the tractor along, known as "pull-bracing grouser area," is reduced. Rolling resistance increases and tracks wear faster because of unnecessary leverage loads. Slower work cycles and a general loss of job efficiency are the penalties paid for this type of mistake.

Wear and tear on the drive train is another result of using shoes too large for the job conditions. When shoes are so wide that the tracks will not slip under overloads in first gear, the drive train takes a lot of punishment from shock loads.

If the shoes slip in first gear under heavy loads, overloading is prevented and the operator is encouraged to take smaller loads at higher speeds. This usually boosts work capacity and reduces down time and maintenance costs. The result is an increase in overall efficiency.

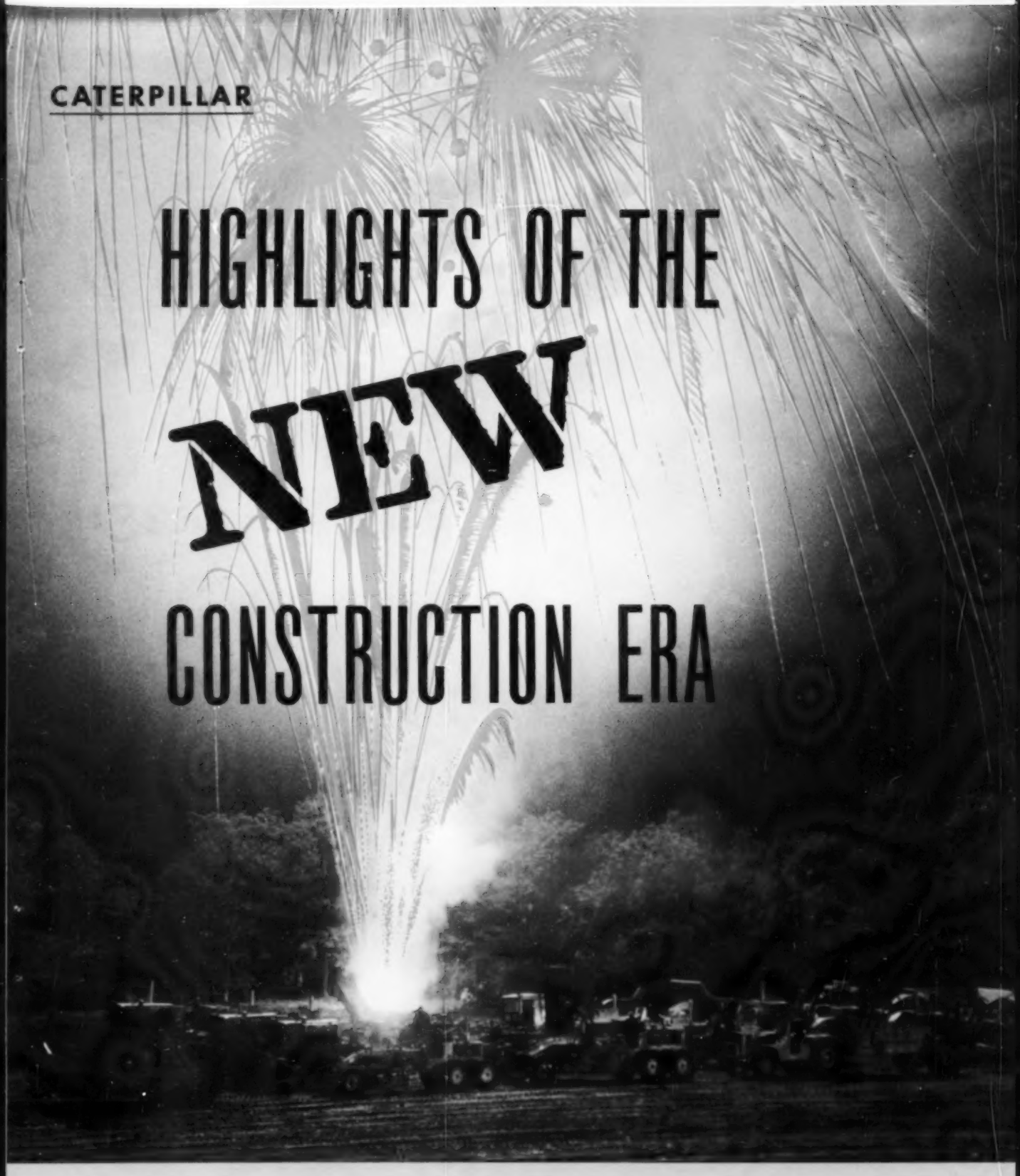
Track wear also usually is greater with wide shoes. When a turn is made, the ground must turn with the tracks. A wide shoe increases twisting stresses against pins and bushings, builds up greater leverage loads against roller flanges, and reduces tractor power on turns.

In rocky ground a very wide shoe offers a very large area of no contact and the concentrated loading might be sufficient to bend the shoes.

There are many jobs where wide track shoes are necessary but you will find that most jobs are done better with track of recommended width. And you will get the most from the available horsepower in the engine. Other big benefits will be better maneuverability, shorter work cycles and more work at a lower cost.

CATERPILLAR

HIGHLIGHTS OF THE NEW CONSTRUCTION ERA



Never before in history has the equipment industry faced such a tremendous challenge as today. We are entering what might well be called the "construction era." Right now construction is the greatest single factor in our industrial economy, employing 12% of our total labor force. And construction can never move forward by itself. Its progress is dependent upon increased production in mines and forests, cement mills and steel plants. Caterpillar Tractor Co. is matching these new opportunities with an array of new products that will increase production, cut maintenance costs, work longer and more profitably than any other equipment on the market. These Caterpillar-built products are the result of continuing research in the laboratory and in the field. They are forceful evidence of Caterpillar Leadership in Action. See them on the following pages.

NEW in track-type tractors!

The new D9

This new giant is a bear for work. Choice of torque converter or exclusive oil clutch drive. First track-type tractor with Turbocharger. Completely new 286 HP engine. "Live-shaft" drive for rear-mounted equipment. Many other important features.

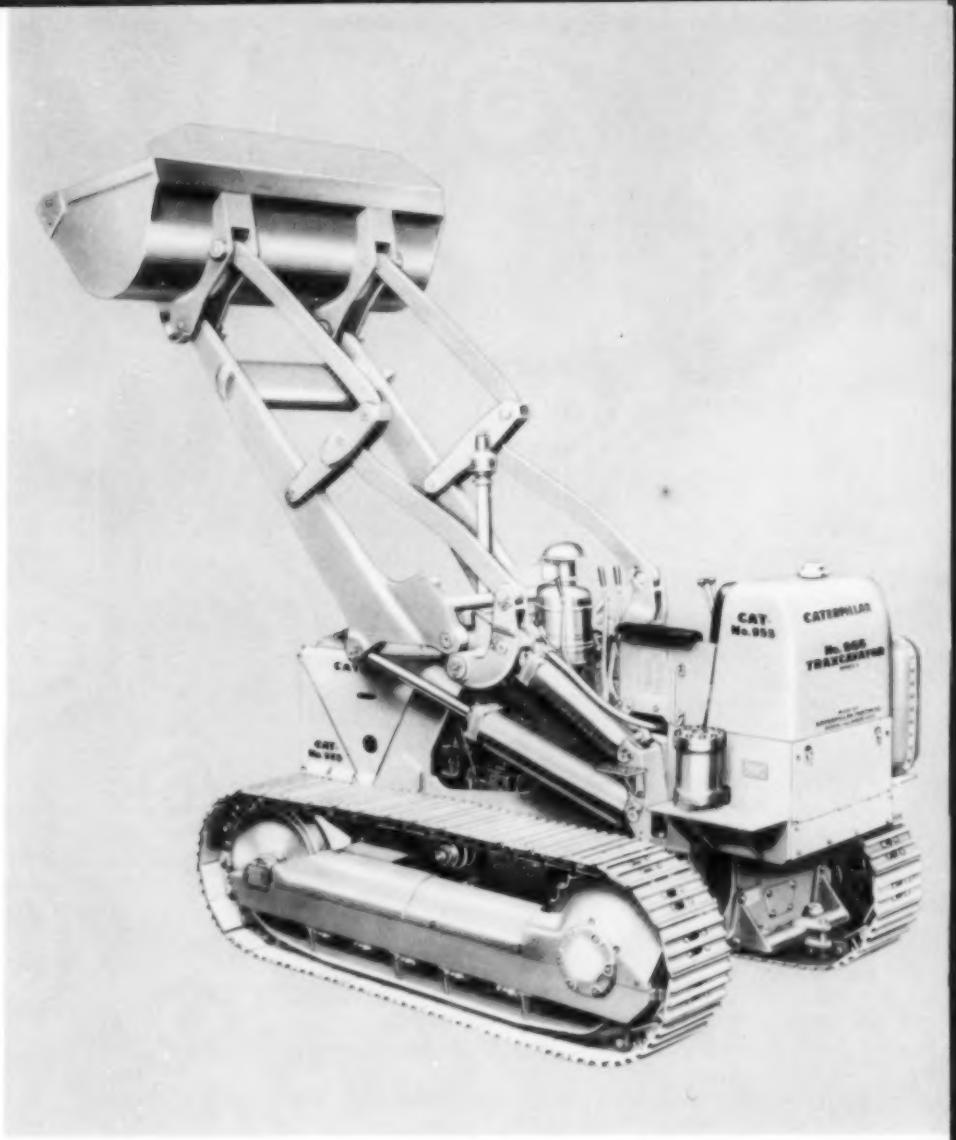
The new D8

With torque converter (Series D) or direct drive (Series E). Completely new 191 HP engine. "Live-shaft" drive for rear-mounted equipment independent of flywheel clutch. New easy controls. Many other improvements. Shown with new Cat No. 463 LOWBOWL Scraper.

The new D7 (Series C)

New 128 HP engine. Drawbar pull 28,700 lb. maximum. Exclusive oil clutch. Finger-tip steering. New starting engine for easier operation. Track shoes hardened by "*water quench*" process (also on D8 and D9). Many other important advances.

LEADERSHIP IN ACTION



No. 955—1½-yard capacity

Balanced for bigger production at lower cost. Major features: 40-degree bucket tip-back at ground level, new oil-type clutch, convenient lift and dump levers, modern hydraulic system, high reach, "designed in" operator comfort, optional starting and versatile attachments.

NEW in Traxcavators!

No. 933—1-yard capacity

Like its bigger brother, *balanced* to outproduce ordinary tractor-shovels of equivalent capacity. Also backed by *one* manufacturer to provide you the advantages of single manufacturing responsibility and one service source. Major features—same as the No. 955!

LEADERSHIP IN ACTION

NEW in wheel-type tractors!

The new DW21 Tractor ▲

(Series C.) New 300 HP Caterpillar Engine with Turbocharger. 10% more rimpull. New No. 470 LOWBOWL Scraper. 18 cubic yards struck, 25 cubic yards heaped capacity. New, wide-section 29.5-29 tires give big-footprint flotation and maximum traction. Many other new, thoroughly tested features.

The new DW15 Tractor ▶

(Series C.) 186 HP valve-in-head Caterpillar Engine. Speeds up to 24 MPH (31.3 MPH with optional gears) pulling loaded wagon or scraper. Heavy-duty clutch has air booster. Air brakes. Wide range of speeds: 10 forward, 2 reverse.

The new DW20 Tractor

(Series E.) Shown with new No. 456 LOWBOWL Scraper. This great new team highballs up to 32.1 MPH for fast cycle times. Same 300 HP engine with Turbocharger and wide-section tires as DW21. LOWBOWL design loads more material in less time by using tractor and pusher power at maximum efficiency.

LEADERSHIP IN ACTION

NEW in pipelayers!

The new No. 583

Here, for the first time, is a pipelayer that is *all* pipelayer—not a tractor attachment. It's the most efficient, highest capacity pipelayer in history. Lifting capacity of 130,000 pounds and 21-inch clearance. Three-stage torque converter in main drive and new hydraulically actuated counterweights. Stability is unequalled. A heavy-duty constant-mesh pipelayer winch transmission drives directly from the engine. Many more important advances, all designed to produce more profits for pipeliners.

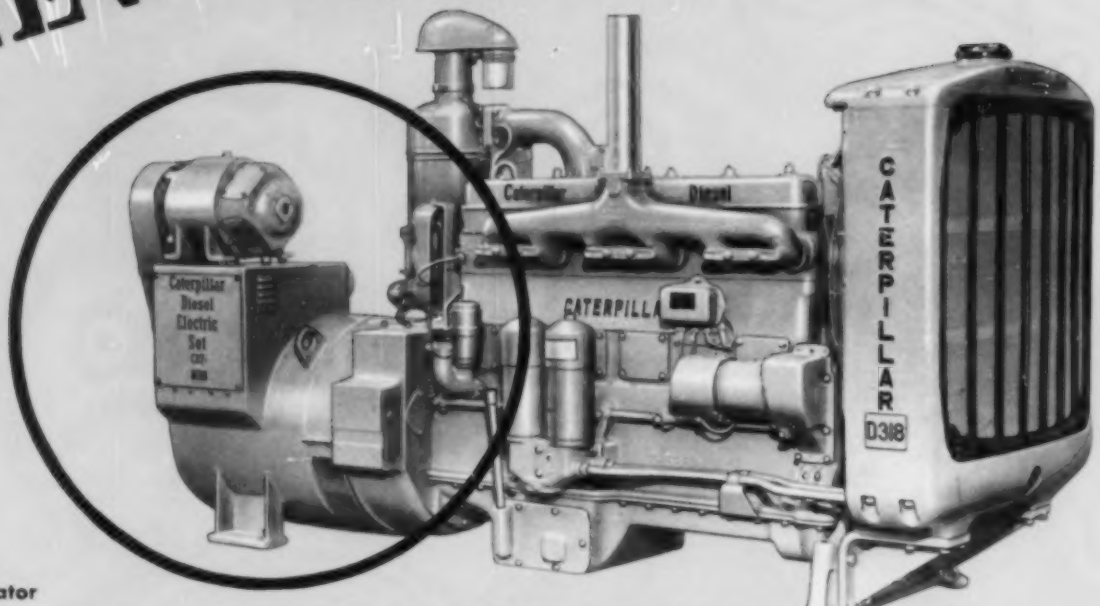
NEW in motor graders!

The new No. 12 with oil clutch

With the addition of the job-proven oil clutch, the big, versatile No. 12 Motor Grader gives you more economy and efficiency than ever. The new clutch increases work life since the constant oil bath lubrication reduces wear on all moving parts. There is less maintenance; 1500 hours without adjustment is not unusual and no external lubrication is needed. The new No. 12 is more efficient because the clutch is constantly cooled, eliminating clutch fade and slippage due to overheating.

LEADERSHIP IN ACTION

NEW in generators!



Cat Generator

A major development in modern electric power. Brings to Caterpillar's new line of Diesel Electric Sets the efficiency of the externally-regulated set in a self-regulated set. Many advantages! Close regulation of voltage, simple control, excellent motor-starting ability, easy hook-up with other generators . . . 100% backed by Caterpillar.

NEW in diesel engines!

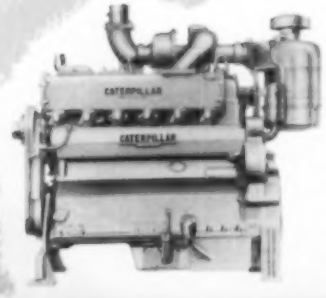
D342—210 HP maximum @ 1200 RPM

Incorporates the latest advances in modern, compact, heavy-duty diesel design. Offers better operation, less maintenance, higher horsepower. Choice of 3 starting systems—air, electric, gasoline. Like all Caterpillar Engines, burns wide range of fuels without fouling.

D339—140 HP maximum @ 1200 RPM

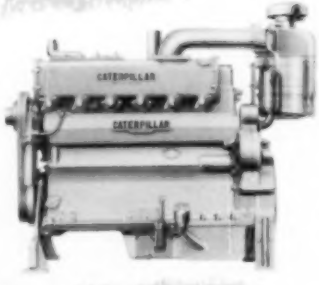
Combines new compactness with greater efficiency, economy and higher horsepower. A modern, heavy-duty 4-cylinder unit with new smoothness of operation. Choice of 3 starting systems. Many other advantages, including full-flow filtering system.

D337 (Series F) with Turbocharger 310 HP maximum @ 2000 RPM



New Turbocharger utilizes exhaust heat to drive supercharger, delivers air in proportion to engine's need. New hydraulic valve lifters practically eliminate adjustment, provide quiet operation. Greater displacement for more power. Choice of 3 starting systems. Available as Electric Sets and Industrial Engines with complete line of attachments.

D326 (Series F)—200 HP maximum @ 2000 RPM

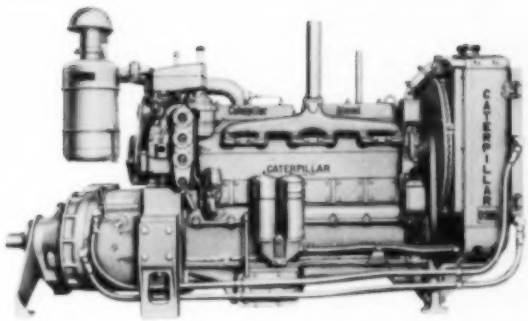


Like other new, heavy-duty Cat Diesels, offers you more for your money than any engine in its power range. Many major features, including hydraulic valve lifters and full-flow filtering. Greater displacement for more power. Choice of 3 starting systems. Available as Electric Sets and Industrial Engines with complete line of attachments.

LEADERSHIP IN ACTION

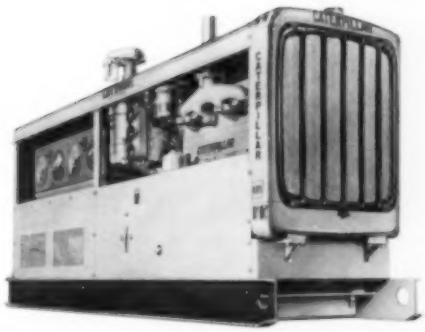
NEW in torque converters!

Caterpillar now offers a wide choice of torque converter power units in standard packages. Torque output is automatically matched to load for smooth load starts or control of load without use of clutch. Overloads can't kill engine. Your Caterpillar Dealer can supply these units. He also has full facilities and parts for service.



NEW in welders!

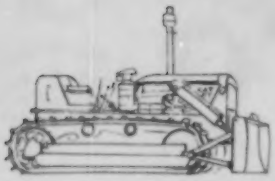
The new Caterpillar Twin Arc-Welder provides one engine, one base, and TWO 300-ampere welding generators. Four-cycle Cat Diesel picks up load instantly without missing or injector trouble. Compact design cuts transport and maintenance cost. Operators can weld at different voltages at same time. Single (3 KW) exciter cuts weight and size, provides ample excitation plus plenty of 115-V. DC for auxiliary tools.



NEW in portable electric sets!

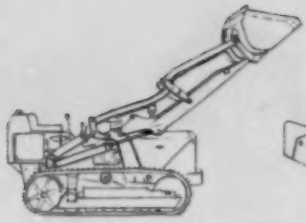
Cat Portable Electric Sets are now available in nine models, 30 to 315 KW, and in all usual voltages, 50 to 60 cycle. They're complete units with cooling system, fuel tank and switchgear, mounted on skids, semi-trailer or full trailer. Easy to hook up and operate, ready to work anywhere.

LEADERSHIP IN ACTION

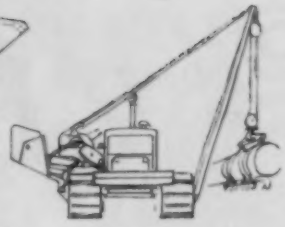


TRACK-TYPE TRACTORS

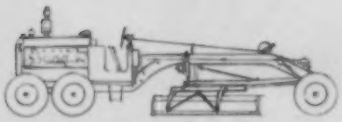
WHEEL-TYPE TRACTORS



TRAXCAVATORS



PIPELAYERS

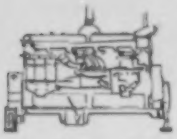


MOTOR GRADERS

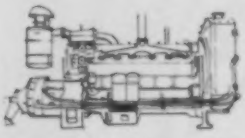
SCRAPERS

BULLDOZERS

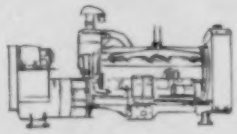
RIPPERS



INDUSTRIAL ENGINES

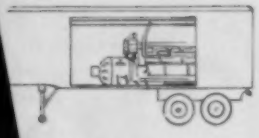


TORQUE CONVERTERS

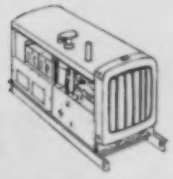


GENERATORS

FOR YOU CATERPILLAR LEADERSHIP PROVIDES THE MOST COMPLETE LINE IN THE INDUSTRY



PORTABLE ELECTRIC SETS



WELDERS

Year after year you have seen the results of Caterpillar leadership. It is always in action. It never stands still. The full resources of Caterpillar research, both in the laboratory and right in the field with you, are constantly devoted to improving products and developing new ones. This means that Caterpillar is your partner in progress, bringing you better and better products, greater opportunities for profitable work. Caterpillar Tractor Co., Peoria, Illinois, U. S. A.

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LEADERSHIP IN ACTION

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EQUIPMENT NEWS

Parts Swap Feature Of Trailer Dump

Kenworth Motor Truck Corp., Seattle, Wash., announced last month that it was manufacturing a new earthmoving truck-tractor and semi-trailer dump. Labeled the 802-B, the unit has already seen service in a Nevada mine. Vital statistics include a 32-cu yd struck capacity, a gross combined weight of 165,000 lb, and a 300-hp turbo-charged Cummins NRT-600 diesel.

When dumping, the entire trailer raises as its rear wheels move forward to a position behind the tractor tires. Its fifth wheel, equipped with a ball and socket, was designed for flexibility during dumping. A special guide and equalizer eliminate strain or twist on the twin, three-stage Kenworth telescopic hoist.

A special feature that means greater economy, says the company, is the interchangeable parts between truck and trailer. Wheels, rims, bearings, brake assemblies and tires can be used on either tractor or trailer.

The entire vehicle, including the dump body and hoist, is sold as a complete unit. Its all-welded steel construction, braced with box section ribs, has been reinforced longitudinally between the ribs of its body. A variable section frame brings the deepest section (15½ in) at the point of greatest loading. Channel side members are machine welded steel plate, according to the manufacturer.

Magnetic Drive Powers Rough Sizing Screen

A Pennsylvania screen manufacturer, Syntron Co., said last month that it was producing a "Pulsating Magnet" vibrating screen that was "an economical and effective medium" for high capacity scalping and rough sizing operations. The screens, labeled "VSF models," were being made in four sizes, Syntron said: 18x36, 24x48, 36x60 and 48x72 in. Powered by dust-sealed electro-magnetic drives, the VSF models operate on 220 v 60 cycle AC or 440 v 60 cycle AC.

Rigid steel frames support replaceable screening surfaces. Phosphor, bronze, stainless steel or high tensile steel woven wire cloth with openings for 20 mesh to ¼ in are available. These, Syntron said, are top and bottom hook-strip type that have been designed for quick installation and replacement.

Each model is sold with a separate electric controller that can be mounted on a wall. A tap switch in the controller can be adjusted to control the screens' vibrating amplitude. Specifications, data and literature are available from the manufacturer, 975 Lexington Ave., Homer City, Pa.

PRINTED IN U. S. A.

Grader's Blade Pressure 10,950 Lb

A heavy-duty motor grader, powered by an Allis-Chalmers ADS-516 six-cylinder, four-cycle diesel engine with a rated 120 maximum brake hp at 1600 rpm, has been introduced by the Allis-Chalmers tractor group, Milwaukee, Wis.

The "Forty-Five" grader weighs 23,800 lb, of which 17,375 lb rests on the tandem drive rear wheels, 6,425 lb on the front wheels. Blade pressure is 10,950 lb. The grader can move ahead up to 20.6 mph and up to 7 mph in reverse. Throttled down by a governor to half speeds, the grader loses no rim pull.

An outstanding development incorporated in the "Forty-Five," says Allis-Chalmers, is a finger-tip control box with toggle-type linkage affording increased leverage for operation of moldboard, wheel lean and scarifier.

Other basic design features of the "Forty-Five" include combination mechanical-hydraulic power steering and self-energizing brakes.

'Easy-Acting' Clutch Feature Of Compressor

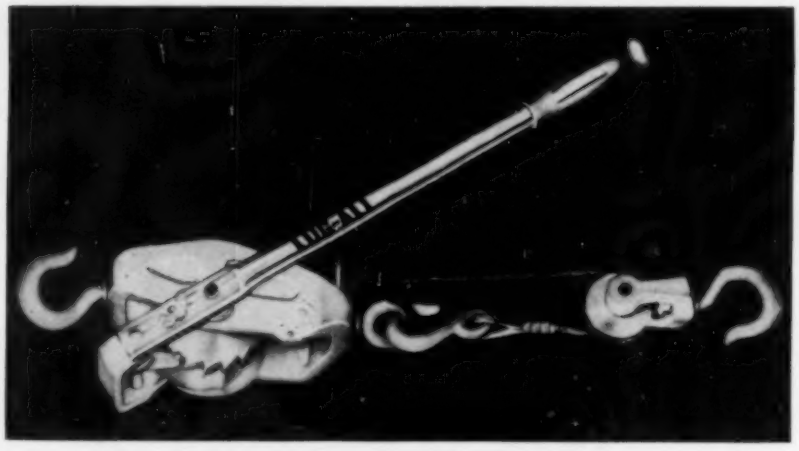
A portable-rotary compressor, the "Blue Brute 600," has been placed on the market by the Portable Compressor & Contractors' Tool Div., Worthington Corp., Harrison, N. J.

The compressor, says the company, is a unit with new design and engineering features. An "easy-acting clutch," it says permits operators to warm up the engine before cutting in the compressor. This feature, the company maintains, results in less wear, quicker starts in cold weather, and simplified engine upkeep.

Self-draining, the compressor eliminates oil and moisture settling in low areas of cylinders, inter-stage chamber and discharge point. The "Blue Brute's" cylinder arrangement gravity-drains oil and moisture during shutdowns. The feature was designed to protect blades during cold starts.

Additional features of the 600-ft compressor include a two-stage oil separator, a separate oil reservoir and air tanks, and a shorter wheel base for easier handling on the job.

The company claims it has used the most up-to-date engineering principles.



Long Cable Boosts Power of Lightweight Hoist

A lightweight 2-ton winch hoist equipped with an extremely long cable has been developed, says its maker, because it "fulfills a longstanding need." The Lug-All Co., Haverford, Pa., says its hoist will lift, lower or pull 2 tons a distance of 10 ft when a double cable is used (picture), or handle 1 ton a distance of 20 ft when a single cable is used.

The hoist weighs 15 lb and the manufacturer has included these features: (1) a protective type main frame of high grade aluminum alloys to permit easy inspection and cleaning, (2) life-time-oiled bearings, (3) stainless steel springs, (4) three workable hooks, (5) smooth operation in any position, and (6) a built-in pulley that can be used as a "snatch block" in close quarter work.

Safety is assured, says the manufacturer, since the "safety handle" bends before the hoist can be overloaded. An interlocking pawl system securely locks the load and there are no brakes to slip. Free release operates only under no load. Lug-All says a tamperproof set-up can be obtained by removing the handle.

do it yourself!

The enthusiastic acceptance of the New S20 VAC-NU-MATIC dust collecting stoper makes it desirable for you to order now for early delivery. We have hundreds of machines in process but demand is ahead of production.

For sales, service, information or demonstration contact any of the following: West Virginia and Pennsylvania — Acme Machinery Company, Williamson, W. Va., Schroeder Brothers, 3116 Penn Ave., Pittsburgh, Pa., Birmingham District — Equipment Service Company, Inc., 617 N. 9th St., Birmingham, Ala.

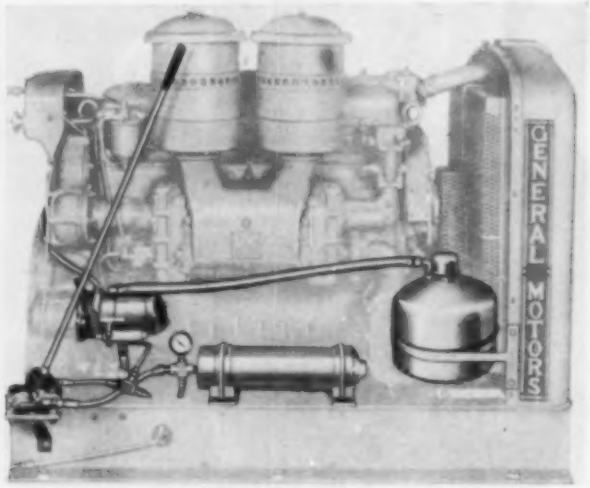
CLEVELAND ROCK DRILL DIVISION
Westinghouse Air Brake Company
12500 BEREA ROAD • CLEVELAND 11, OHIO

RD-72

Pulling Power On Rail or Road

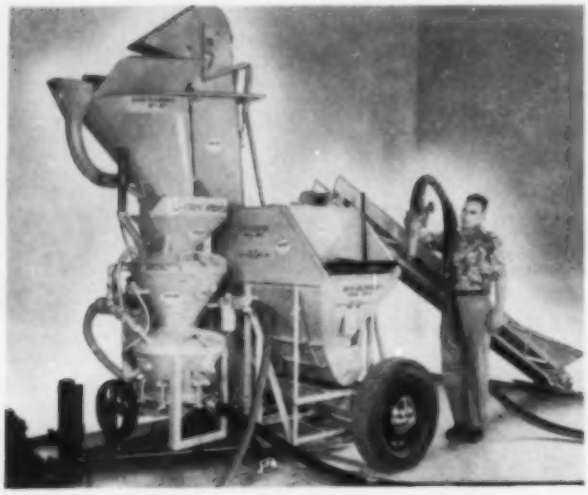
Whiting Corp., Harvey, Ill., has developed what it calls its heavy-duty "Trackmobile" designed to operate on both road and track. The conversion from road to rail takes 90 sec.

The "Trackmobile" develops a draw-bar pull much greater than its own weight of 9,000 lb, according to the company. After the machine has been coupled to a car, a constant-pressure type hydraulic jack lifts the car and transfers part of its weight to the "Trackmobile." This enables the machine to develop some 12,800 lb of draw-bar pull. The vehicle is driven by a V-8 industrial engine and has a tractor-type suspension to protect against shock when mounting ungraded track. The company says it will pull six full freight cars.



Diesels to Get Hydraulic Start

A hydraulic starting system for diesel engines has been developed by General Motors. Tested in the field, the system is available for installation on "GM Detroit" diesel engines. Named the "Hydrostarter," the system is not affected by temperature, humidity or altitude, the company says. Gas pressure built up behind a piston in a sealed accumulator cylinder forces oil through a hydraulic starting motor. When the engine starts an engine-driven pump forces oil back into the cylinder, recompressing the gas and automatically recharging for the next start. The initial charge is accomplished by means of a hand pump. The unit is then self-sustaining. Detroit Diesel Engine Div., General Motors Corp., Detroit 28, Mich.



Concrete Rig to Save Labor

The production of a new portable concrete gunning rig was disclosed last month by Air Placement Equipment Co., Kansas City, Mo. The rig is made of three basic pieces of equipment used in concrete gunning operations: the "Nucretor" concrete gun; the "Mix Elvator" automatic proportioning, dry mixing and elevating machine; and what the company says is its "newest labor-saving device in the assembly," a sand loader. The sand loader operates from a power take-off from the drive mechanism of the "Mix Elvator." The Nucretor has greater capacity (2 to 8 cu yd an hr) than before and is equipped with an "Airplaco" gunning nozzle. The entire rig may be hitched to either the air compressor or a truck trailer.

Light to Heavy Truck Line Out

International Harvester Co. has announced another line of trucks. Labeled the "S-line," the trucks are four- and six-wheel gasoline and LPG-powered and range in gross weight from 4,200 to 33,000 lb. They include models from a light-duty S-100 series through a heavy-duty S-180 series of pickup, panel, stake, multistop delivery models, farm trucks and truck-tractors. Five forward cab models also are being produced along with a fire truck, school bus, four- and six-wheel "Loadstar" dump-truck chassis and three four-wheel-drive models, including a new light-duty 4x4 S-120 (picture) rated at 7,000 lb GVW. Chassis prices for the light-duty S-100 through the heavy-duty S-180 trucks are $65 to $150 higher.

Lowest cost per ton
Self-propelled from hole to hole
Heavy-Rugged-Powerful

● Delivering 250 to 300 tons of coal per day using 36-inch diameter, 6-foot-long augers, the Model 6 McCarthy Coal Recovery Drill lowers your costs per ton and total operating costs. Shorter in length—only 18′ by 6′ wide—the Model 6 operates easily in narrow strip pits or where operators are "facing-off" hillsides for auger boring. The self-propelled drill moves quickly from hole to hole, carrying the same rugged power as the Model 12 and 14 McCarthy Drills.

HYDRAULICALLY OPERATED

LEVELING JACKS · AUGER LIFT · MOVING JACKS
AUGER GUIDE · AUGER FEED

Let us check your property to recommend the right McCarthy Coal Recovery Drill for maximum tonnage at lowest cost. Send for Bul. M-101. The Salem Tool Company, Salem, Ohio.

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MODEL 6-30-36 x 6 McCARTHY COAL RECOVERY DRILL with G.M.C. 4-cylinder diesel engine, FAU Cotta transmission, 14" Rockford Clutch, speed reducer and box-type main frame and engine base. Sizes available for using 20, 24, 30, 36 and 42" diameter augers.

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SOUTH ELLSWORTH AVE. · SALEM, OHIO, U. S. A.

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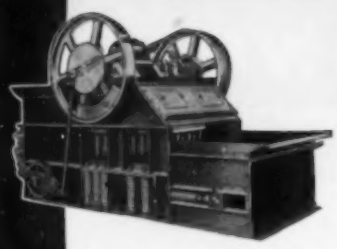
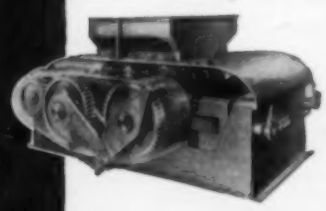
AVAILABLE FROM STOCK AND [illegible] DELIVERY



McNally Norton Vertical Pick Breaker

50% less fines when reducing lump to egg and stove sizes.

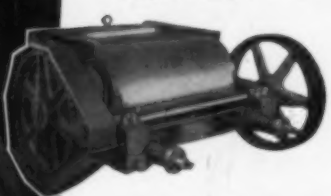


McNally Double Roll Gearmatic R. O. M. Breaker

Built in tonnage ranges from 750 tph to 1400 tph. Full floating Gearmatic drive.

McNally Gearmatic Stoker Coal Crusher

This unit offers three prime advantages:
High volume production, plus accurate sizing, plus low percentage of fines.



McNally Single Roll Crusher

Universal application. 20", 24" and 36" dia. rolls.

For immediate action on complete information write, wire or call . . .

Mc

★ Pittsburg, Kansas ★
★ Wellston, Ohio ★

Boost Tractor's Traction

A rubber-tired 42-hp wheel tractor, the "International 300" utility model, designed for the industrial field, is being sold by International Harvester Co., Chicago, Ill. Powered by an IH C-169 gasoline engine, the tractor weighs 3,820 lb, or 1,000 lb more than tractors of comparable size and class. The added weight provides greater traction, strong power train and axles, according to International engineers. It is available either in a standard five-speed transmission or torque amplifier drive. Equipped with the torque amplifier the tractor will travel from 1.5 to 16.7 mph in ten forward speeds. At the same time the torque amplifier supplies continuous power to the drive wheels when changing tractor speeds. Specifications: wheelbase, 75 in; length, 118 in; overall width, 59½ in; clearance, rear axle, 19½ in; front axle, 20½ in; turning radius, 9 ft 8 in.

Bucket Tips 40 Deg

Another two-wheel-drive "Payloader" tractor-shovel, Model "HAH," is being produced by the Frank G. Hough Co., Libertyville, Ill. The new model has a struck capacity of ¾ cu yd and a heaped capacity of 1 cu yd. Of particular interest to users, says the company, is a bucket breakout action that permits 40 deg of tip-back at ground level. The model has a breakout force of 4,500 lb, a lifting capacity of 4,000 lb and a carrying capacity of 3,000 lb at 4 mph. Designed for stockpile work, the unit has a short turning radius, rear-wheel power steering and a high lift of 7 ft 9 in.

A torque-converter drive and a four-speed full-reversing transmission are combined with a gas engine developing 57 hp. Travel speeds range from 0 to 14 mph in forward and from 0 to 23 mph in reverse.

Plastics In Mine Battery

Polyethylene tubes and tube sealers, encasing active material and grid spines of positive plates, are new features of "Exide-Ironclad" industrial batteries that promise an increase of 20% in battery life, the maker says. The finely slotted tubes keep active material in contact with the grid spines, permitting free penetration by the electrolyte. Polyethylene tube sealers, securely attached to the bottoms of the tubes, firmly seal in the active material and prevent short circuits. Big advantages of polyethylene are that it withstands a wide range of working conditions within the battery, the slots retain their original designed dimensions and its elasticity is ideal. As

a result, the battery is able to deliver its full rated capacity initially. Mine locomotive batteries with the new tubes and tube sealers now are available. Full details available from Exide-Industrial Div., Electric Storage Battery Co., Box 8109, Philadelphia 1, Pa.

Portable Unit For Stores

A portable, one-man operated material, tool and equipment storehouse has been introduced to industry for the first time, asserts the manufacturer, Material Master, Inc., 3508 W. Irving Park Blvd., Chicago 18, Ill. The "Material Master" is a mobile storage unit that the maker says will cut overhead and increase labor efficiency by providing on-the-spot supplies. Manufactured in 42 in and 128 in lengths, 45 in wide and 50 in high, the units are constructed of a heavy gage rolled corrugated galvanized sheet steel mounted to a wooden flooring. The store-

MODERNIZATION:
key to profitable strip mining

Bucyrus-Erie 1050-B stripping shovel, with 45-yd. dipper, stripping overburden in Sunnyhill Coal Company mine at New Lexington, Ohio.

BUCYRUS-ERIE STRIPPING SHOVELS: key to efficient modernization

When you modernize with a Bucyrus-Erie stripping shovel, you've taken a long step toward the big output, low-cost stripping necessary for profitable operations.

These long range stripping shovels offer front-end design featuring superior strength with minimum weight, powerful digging action, and long life. Ward Leonard variable-voltage control provides quick response, smooth acceleration and deceleration, and flexibility of operation that maintains high operating speed for maximum output.

Modernization is a major part of the solution to the problem of rising costs — Bucyrus-Erie stripping machines can provide a major part of any modernization program in strip mining. 59L55

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South Milwaukee Wisconsin

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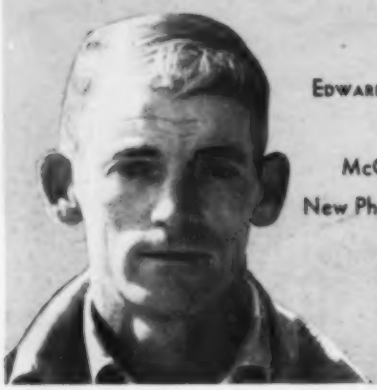
YEARS OF SERVICE
to Men Who Shape the Earth

"YELLOW STRAND FLATTENED STRAND gives us better service than any other wire rope!"



says
EDWARD A. McGINNESS
Partner
McGinness Bros.
New Philadelphia, Ohio

Edward A. McGinness, Partner, McGinness Bros., New Philadelphia, Ohio, has used a lot of wire rope on his equipment over the years. So, he knows what he's talking about when he says, "Yellow Strand Flattened Strand gives us better service than any other rope!" He uses Yellow Strand Flattened Strand in his K-595 Link Belt Speedster which gives him an average 170 yds. per hour production of overburden at Kroman Coal Co., Bolivar, Ohio.

Coal strippers and handlers prove it pays to switch to Yellow Strand Flattened Strand when sheaves, drums or the rope itself wear too fast. Unlike ordinary wire rope, the strands in Yellow Strand Flattened Strand are laid up in triangular form to obtain a smoother outer surface, greater metallic area, a corresponding increase in strength plus a compactness unobtainable in round strand construction. It is not uncommon for users to get twice the service and sometimes even more.

So, if your sheaves, drums and rope are wearing too fast, solve the problem with Yellow Strand Flattened Strand. Call your Broderick & Bascom distributor today or write us direct.

Yellow Strand

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Manufacturers of Wire Rope for 80 Years

655 Edmunds St., Seattle 8, Wash.
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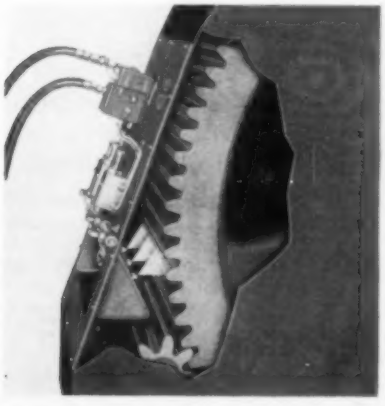
1330 W. Fulton St., Chicago 7, Ill.
2441 Hunter St., Los Angeles 21, Calif.
9350 Market St. Road, Houston 15, Texas

house can be moved easily from one place to another with the "Porta-Trailer," also manufactured by Material Master, Inc. The trailer is steel with a coil-spring axle designed to move one 128-in or three 42-in "Material Masters" on its 130-in trailer bed.

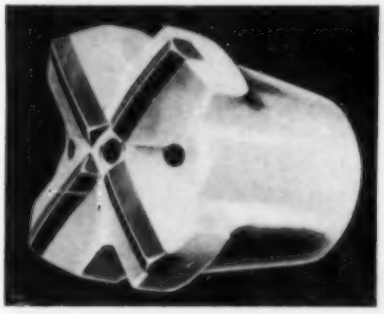
Loaders Use No Clutches

Trojan line of tractor loaders, ½- to 1½-yd capacity, feature Torqmatic transmissions to eliminate clutches, 360-deg operator vision and reverse-curve loading arms for operator safety, straight-line horizontal thrust which permits a low push point and greater traction, independent bucket action for faster, easier loading entirely independent of hoist and low load-carrying position for greater stability, faster travel and less spillage. Literature on full line available from Contractors Machinery Co., Inc., Batavia, N. Y.



Spray Panel Greases Gears

"Spray valve panels," a development of the Farval Corp., are designed to spray-lubricate bull gears, girth gears, such as those on grinding mills and kilns, and other spur or herringbone gear trains. The self-contained panels, after being fastened to gear housings or frameworks, spray a lubricant on the pressure side of gear teeth. With a size of 2x3 ft, the panels' features are stainless steel spray valves and built-in nozzles. Central pumping units deliver gear lubricant at regular intervals through a circuit of measuring valves. The measuring valves distribute the lubricant under pressure to the spray valves where it is mixed with air to form a spray. Farval Corp., 3249 E. 80th St., Cleveland 4, Ohio.

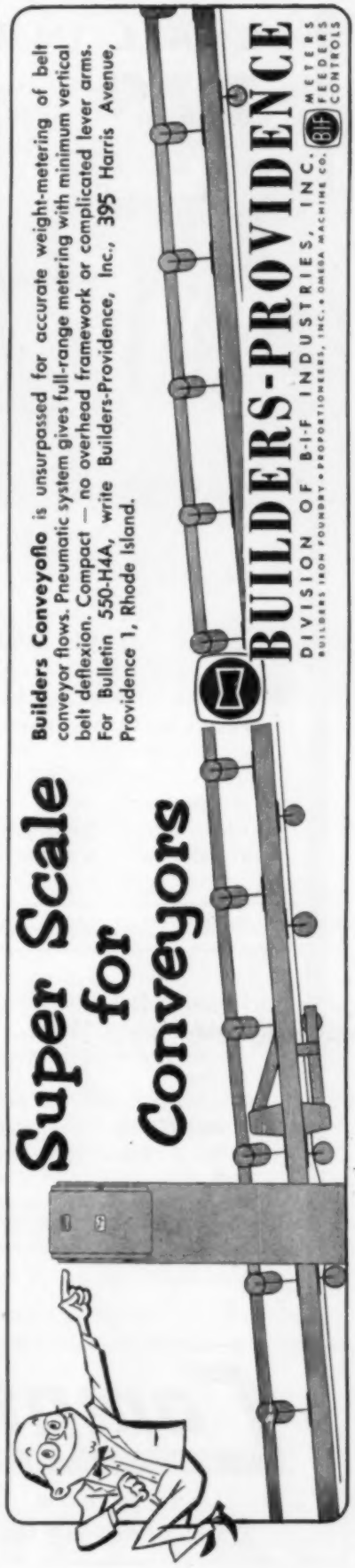


Rock Bit Needs No Adapter

A carbide-insert, Brunner & Lay "Rok-Bit," designed for use on J-7.50 threaded drill rods, is being offered in 4-, 4½-in gage sizes. It has been made to fit directly on the steel without need for an adapter. The bit has a center hole, two additional holes on the face and two more on the sides, or five air holes in all. This, the manufacturer says, means better chip removal, and prevents the bit from working in its own cuttings. Chicago Brunner & Lay Rock Bit Corp., 9250 King St., Franklin Park, Ill.

Poles Joined For Tamping

Lightness, strength, and flexibility have been combined in sectional explosives tamping poles, says the maker, Ideal Explosives Supply Co., Asheville, N. C. The 10-ft pole sections join to form a tamping pole adaptable to any depth hole. For tamping explosives the sections may be joined by a slotted log-chain joint (photo) during insertion and disconnected as they are withdrawn. The sections are 1½ in in diameter with joints of non-sparking magnesium-bronze.


Super Scale for Conveyors
Builders Conveyoflo is unsurpassed for accurate weight-metering of belt conveyor flows. Pneumatic system gives full-range metering with minimum vertical belt deflexion. Compact — no overhead framework or complicated lever arms. For Bulletin 550-H4A, write Builders-Providence, Inc., 395 Harris Avenue, Providence 1, Rhode Island.
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DIVISION OF B-I-F INDUSTRIES, INC.
BUILDERS IRON FOUNDRY • PROPORTIONEERS, INC. • OMEGA MACHINE CO.
METERS
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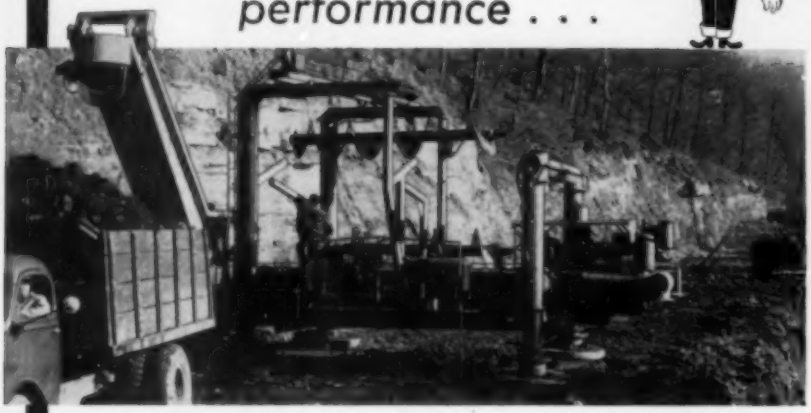
SMALL IN SIZE . . .

BIG *in performance . . .*

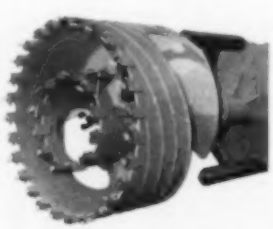


Compton Budget Model 28 Coal Auger

The latest of the famous, efficient Compton Coal Augers, but already known for its record setting performance figures. Only 28 feet long this Compton Auger, with a crew of just 3 men will auger and load up to 65 tons of coal per hour. Compact and lightweight, it is right at home even in cramped quarters and does not require a great deal of costly advance preparation.

GENERAL SPECIFICATIONS — MODEL 28

Length: 28 feet
Weight: Approx. 25 tons
Carries twelve 12½ ft. auger sections
Required pit width: 30 ft. min.
Power: 175 hp Diesel engine
Hydraulic Frame Jack Lift: 54 inch
Auger Diameter: 44″ to 28″
Drills coal within 4¾″ of the bottom
Max. Drilling Depth: 150 feet



Only Compton Augers are equipped with the job-proven, non-clogging Compton Lump Recovery Head. Their built-in spider bearing assembly assures straighter drilling with less frictional drag.

Compton, Inc.

ORIGINATORS OF COMPTON LUMP RECOVERY HEADS

BOX 1946 ● TELEPHONE 4-6384
CLARKSBURG, WEST VIRGINIA

Any size wooden tamping plug may be attached to the end of the pole.

The sectional tamping pole has been used to depths of 120 ft.

Cranes Lift 12½ to 35 Tons

Five truck-cranes with 12½- to 35-ton lifting capacities are being offered by Link-Belt Speeder Corp., Cedar Rapids, Ia. Named "Zephyrcranes," the models are equipped with "Speed-O-Matic," a power hydraulic control. All have hydraulically operated clutches, can be converted to standard front end attachments and are mounted on carriers with full-floating rear axle supports.

To Make Chain Couplings

"Taper-Lock" chain couplings have been added to the taper-lock sprocket and roller chain products of the Dodge Mfg. Corp., Mishawaka, Ind. The couplings are flexible in type and permit sufficient relative movement between the hubs to accommodate slight angular and parallel shaft misalignment, the company says. Among the features of the couplings are "taper-lock" bushings, for which no reboring is required. Installed on full size or normally undersized shafts, they give the equivalent of a shrunk-on fit. The coupling's chain is a double-width, standard precision chain that conforms to ASA specifications. An additional bearing area permits higher horsepower ratings. Quick disconnecting of the shafts is possible by removing the single coupling pin and unwrapping the chain from the hubs.

Modern Truck Features That Mean Business!

Chevrolet trucks have got it! A full list of modern features that mean better business—on the job today and at trade-in time tomorrow!

When you get right down to it, any truck without all of Chevrolet's Task-Force features is still living in the past. Why risk losing money with an old-fashioned truck—both on the job and at trade-in time—when you can get a Task-Force model with the industry's most advanced features?

Most modern power—V8 or 6. There's longer life in Chevrolet V8's (extra cost in most models). With their short-stroke design—shortest of any leading truck—you can count on less friction and wear per mile. If you go for sixes—Chevrolet's gas-saving valve-in-head sixes are famous for their dependability. All engines are sparked by a modern 12-volt electrical system for quicker starting and smoother going!

Most modern comfort and safety features. New efficiency boosting advances like panoramic windshield, High-Level ventilation, softer seat action and concealed Safety Steps!

Most modern chassis features. New suspensions; new, more rigid frames; Power Brakes standard on 2-ton models!

See your Chevrolet dealer for details. . . . Chevrolet Division of General Motors, Detroit 2, Michigan.

NEW CHEVROLET Task-Force TRUCKS

CHEVROLET

investigate this dryer

if you have a coal preparation plant or an interest in stream fines,

the PARRY DRYER offers

1. Low initial investment
2. Low operating cost
3. No down time
4. High thermal efficiency
5. Proven reliability and safety
6. High capacity with flexibility
7. Simple automatic control

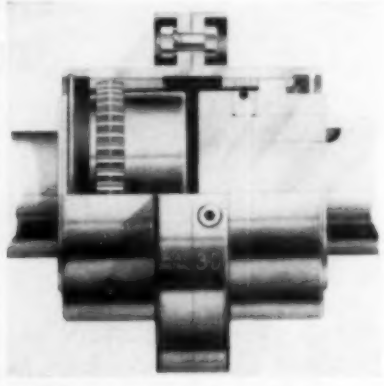
The Parry Dryer, designed for specific installations offers these and many other points worthy of investigation. This dryer handles washer and stream fines and HMS overflow. Complete information is immediately available.

SILVER ENGINEERING WORKS, INC.
3313 BLAKE STREET, DENVER 2, COLORADO

DESIGNERS AND MANUFACTURERS OF INDUSTRIAL AND PROCESS MACHINERY

Pump Fills Gun In 30 Sec

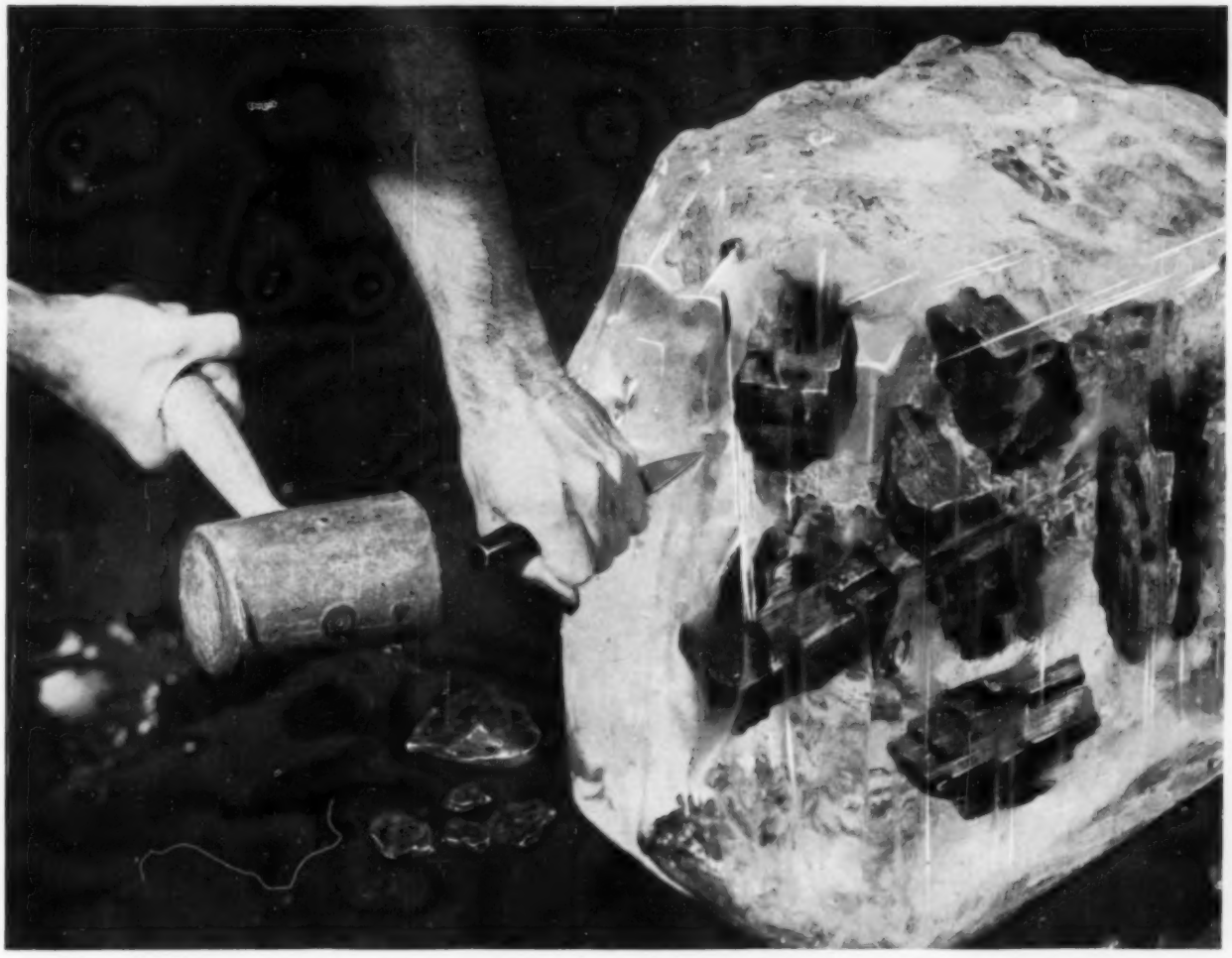
Lincoln Engineering Co. has announced a filler pump to handle medium as well as light greases. It is attached to any 25 lb to 50 lb original refinery container with three thumb screws. The manufacturer says the pump will fill a 1-lb capacity grease gun in 30 sec, completely eliminating contamination and air-pockets. A follower plate is said to assure positive prime in any weather and to empty the lubricant container completely. A self-closing filler socket prevents pumping the lubricant unless the filler nipple of the gun is inserted in a filler socket.



Produce New Couplings

Ajax Flexible Coupling Co., Inc., Westfield, N. Y., is producing a new line of couplings. The Series 3D Dihedral self-aligning couplings were designed, says the company, to handle misalignment up to 3 deg between driving and driven shafts of directly connected machines. They have been built on the same principle as the D-100 series, which has a misalignment capacity up to 12 deg. Included in the features of the new series is a tooth design that permits close tooth clearance. Ordinary gear type couplings, says Ajax, are dependent on backlash for handling misalignment. The company maintains that there is no end-of-tooth wear under misalignment, since the load is normally carried at the center of the tooth, and under maximum rated misalignment the driving force is carried across an entire half tooth.

Frozen Coal–Hard to Handle but easy to prevent!



Freezeproof your coal with Morton "Formula 5"

There's no need for your customers to spend money unloading frozen coal. It's easy to keep your coal free-running . . . keep your customers happy . . . by using Morton "Formula 5", the inexpensive freezeproofing compound made exclusively for the coal industry. Effective even at sub-zero temperatures, "Formula 5" ends costly delays in unloading frozen coal . . . saves your customers time, labor and money.

Morton "Formula 5" is economical to apply. It needs no mixing, no extra handling. It's a free-pouring, dry product composed of sodium chloride (30-70 mesh) and a special anti-corrosive compound. Just apply dry, direct to coal.

"Formula 5" gives you these extra benefits:

• Low cost of application • Scientifically treated to produce an ideal dissolving rate and minimize loss during initial draining • Will not lump in feeder • Contains a rust inhibitor to protect your equipment • Harmless to coal, harmless to hands and clothing • Can be used for conveyor equipment, switches, tracks, etc. • Readily available—comes in tough, 100-lb. bags.

Send for more FORMULA 5 information today!

MORTON SALT COMPANY
INDUSTRIAL DIVISION
Dept. CA-12 Chicago 3, Illinois

Please send me your free booklet, "The Key to Low Cost Freezeproofing Application."

*Name*_____

*Company*_____

*Street*_____

*City*_____ *Zone*_____ *State*_____

BEE-ZEE SCREENS MAKE YOUR COAL MOVE!

Tri-Rod for knife-like separation

BEE-ZEE SCREENS MAKE YOUR COAL MOVE!

Round Rod, for long-lived accuracy

BEE-ZEE SCREENS MAKE YOUR COAL MOVE!

Grizzly Rod, for best features of round and tri-rod

BEE-ZEE SCREENS MAKE YOUR COAL MOVE!

Grizzly Rod, with skid rod, for abrasion protection

Your coal dewaters better, quicker through Bee-Zee Screens. These screens *make you money* by producing a drier coal that "moves" in today's tough market by delivering more BTU's per ton. And less moisture also means less danger of winter freeze-ups.

Bee-Zee Screens offer the exact rod design, screen size and shape for your equipment and operation. They're 100% stainless steel, electronically precision-welded. Bee-Zee Screens can't rust, can't corrode – and reduce "down time" by wearing longer.

Get complete facts by writing or wiring. Or, phone us collect at Galesburg 4397.

BIXBY-ZIMMER Engineering Co.

1215 ABINGDON STREET • GALESBURG, ILLINOIS

Motor's Space, Weight Cut

A re-rated motor design, conforming to dimensional standards recently adopted by NEMA, has been placed in production by the Electro Dynamic Div., General Dynamics, Bayonne, N. J. Designed more compactly than previous types, says the company, the motor has been given the same horsepower in less space and reduced weights.

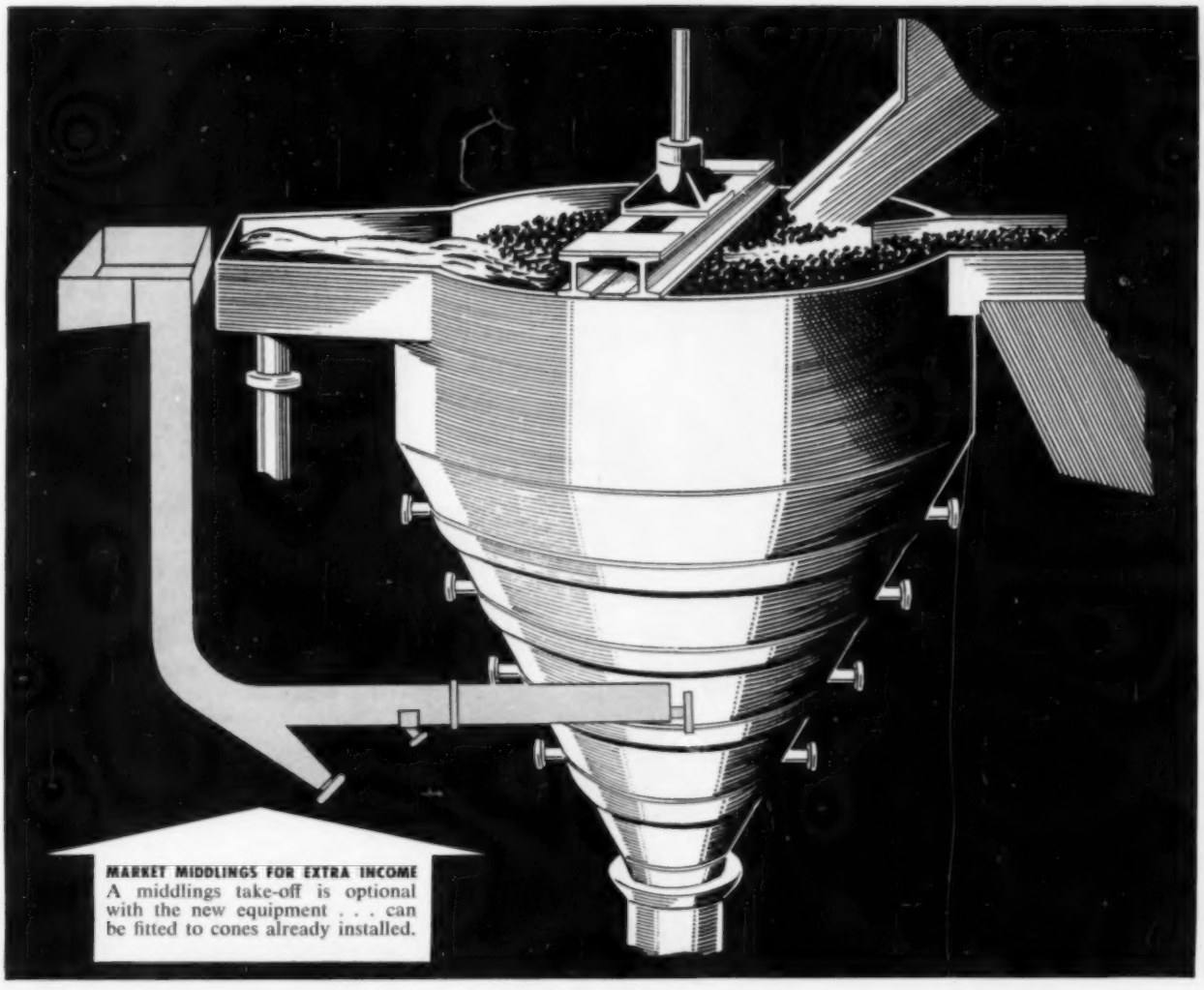
Designated Type H it has been engineered with a low air opening in the end-bell to protect the winding from liquids and abrasive dust. Currently standard ratings are available in frame sizes 182, 184, 213, 215, 254U and 256U. The balance of the re-rated NEMA line will extend to 40 hp, 3600 rpm.

Loader Capacity 3,000 Lb

A hydraulic truck loader, the "LoDaL," has a 3,000-lb capacity and loading speeds up to 2 yd a minute in heavy material, according to its maker, Lodal, Inc., Norway, Mich. Designed to fit most trucks from 1½- to 4-ton capacities, with special models for trucks over 4 tons, the loader makes a truck a complete working unit, says its maker. The truck loads itself and in addition the forward tilting bucket can load other trucks.

Equipment Shorts

FAN AERODYNAMICS—An axial airfoil fan, Type L, has been given two new aerodynamic design features, according to its manufacturer, the Chicago Blower Corp., Franklin Park, Ill. (1) A new hub design has been contoured to approximate the motor's diameter and thus eliminate turbulence over the motor and back flow. (2) An aerodynamic blade



MARKET MIDDLINGS FOR EXTRA INCOME
A middlings take-off is optional with the new equipment . . . can be fitted to cones already installed.

LET US HELP SOLVE YOUR COAL-CLEANING PROBLEMS

Regardless of the size of your operation, the Chance Sand Flotation Process offers the most economical, dependable and lasting solution to your coal-cleaning problems.

Chance Cones now used in all major coal producing areas throughout the world offer these important features:

HIGH SEPARATING EFFICIENCY

. . . Close to 100% recovery of salable coal

. . . Washing gravity not affected by fluctuating rates of feed

WIDE FLEXIBILITY

. . . Coal handled at gravities from 1.35 to 1.65 with size from ⅛ in. to 10 in.

. . . One man can change washing gravity in 5 minutes

ECONOMY OF OPERATION

. . . Heavy, well-built equipment assures trouble-free performance

. . . Equipment requires only part-time attention of one man

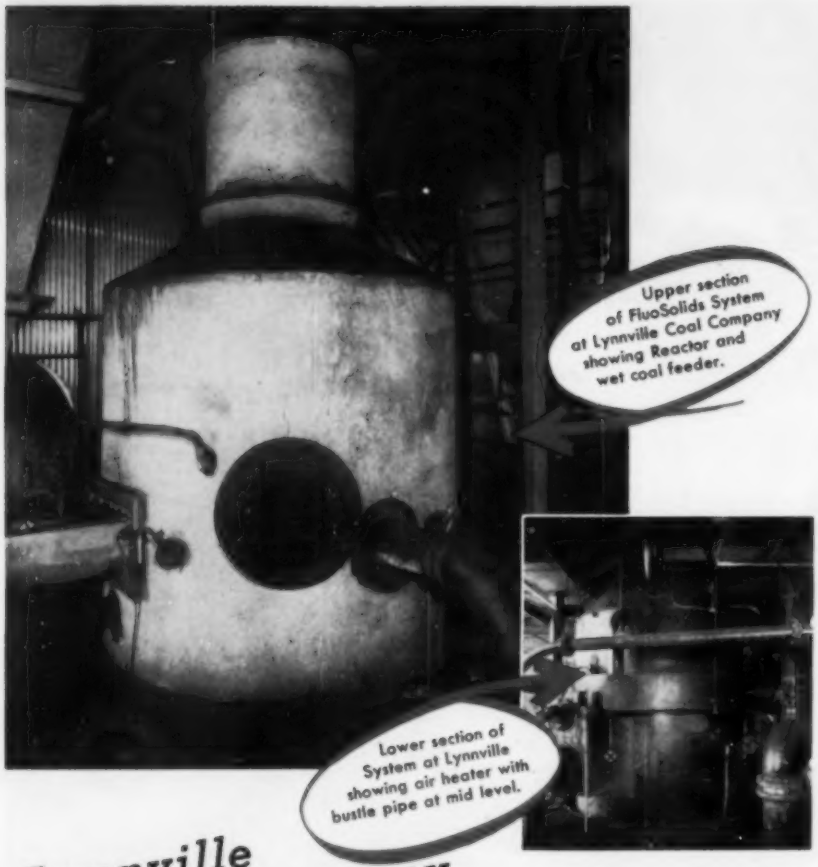
Why not invite our engineers to study and discuss your requirements. Simply call or write

UNITED ENGINEERS

& Constructors Inc

U.E.&C. (Canada) Ltd.

New York 17 • PHILADELPHIA 5 • Chicago 2


Upper section of FluoSolids System at Lynnville Coal Company showing Reactor and wet coal feeder.
Lower section of System at Lynnville showing air heater with bustle pipe at mid level.

Lynnville Coal Company First to Dry Coal with DORRCO FLUOSOLIDS* SYSTEM

First successful application of fluid techniques to fine coal drying, a Dorrco FluoSolids System is now in operation at Lynnville Coal Company, Lynnville, Indiana. The System is currently drying 80 to 90 tons of metallurgical coal per hour . . . and installations are now being projected to dry 200 TPH and up in a single Reactor. Several months of operation at Lynnville have definitely proven the advantages of this new development over conventional dryers.

FIRST — The high drying efficiency inherent in a fluidized bed means instantaneous vaporization of surface moisture. Wet coal is fed to the fluid bed at an automatically controlled rate to maintain within close limits the preselected bed temperature.

SECOND — On a unit area basis, the FuoSolids System has an extremely high unit capacity. The entire drying system at Lynnville occupies only 1350 Square Feet.

THIRD — Close control and simple operation mean quick start up and shut down to meet varying requirements at the tipple . . . and the absence of moving parts in contact with hot gases holds maintenance to a minimum.

If you'd like more information on this radical departure from conventional fine coal dryers, write for a copy of Bulletin No. 7503. Dorr-Oliver Incorporated, Stamford, Connecticut.

*FluoSolids T.M. Reg. U. S. Patent Office

DORR-OLIVER
INCORPORATED
WORLD-WIDE RESEARCH • ENGINEERING • EQUIPMENT
STAMFORD • CONNECTICUT • U.S.A.

design, according to the maker, produces an even distribution of air velocity from hub to tip. Blade angles, large at the hub, decrease at the tip.

TWO-WAY RADIOS—Motorola has introduced two-way radio units under the name of "Twin-V." Able to operate on either 6- or 12-v batteries, the radios have improved receiver sensitivity, noise suppression and voice frequency reproduction, according to the maker, Motorola Communications & Electronics, Inc., 4501 W. Augusta Blvd., Chicago 51, Ill.

SAFETY GOGGLES — Plastic safety goggles weighing 1 oz have been manufactured with hard-surface acetate lenses by the General Scientific Equipment Co., 2700 W. Huntington St., Philadelphia 2, Pa. The goggles fit over prescription glasses and are made in clear or medium green.

LAMP LIGHT BOOSTED—General Electric says it has improved four of its 400-w mercury lamps. The lamps, H400-E1, H400-J1, H400-R1 and H400-RC1, now produce 5% to 12% more light, according to the company. General Electric, Nela Park, Cleveland 12, Ohio.

SUBMERSIBLE BOOSTER PUMP—Two companies, Layne & Bowler Pump, Los Angeles, and General Electric, have jointly produced the "Verti-Line" submersible booster pump. Refinements include an oversize shaft, longer bearings with protective caps, perihedral impeller seals, a mechanical shaft seal and a choice of either mixed-flow or radial-flow impellers. The submersible motor has a larger oil reservoir and a spring-loaded resilient bag that permits the sealed motor to breathe with changing pressures and temperatures.

BRUSH, SPRAY GALVANIZING—Wilbur & Williams Co., Boston 35, Mass., has devised a 95% pure zinc coating applicable with a brush or a spray gun. It will renew galvanized parts, says the company, that have lost their original protective coats of zinc. The coating can also be applied to standing towers, fences or air conditioning ducts already in position that could not otherwise be zinc-coated.

"20-YR" BATTERY—A nickel and cadmium battery named "Voltabloc" is said by the manufacturer, Saft/America, Lodi, N. J., to last up to 20 yr. Hermetically sealed, no damaging fumes or liquids are given off in normal operation and it performs in environmental temperatures 40 to 160 F. Peak discharge rates up to twenty times capacity are permissible. The batteries are available in sizes from 0.8 amp hr to batteries with discharge peaks equal to any requirement known.

TRACTOR, BULLDOZER RIPPERS—Two "Ransome" rippers, the R-78 and the R-46, have been introduced by the Ransome Corp., 2729 Hunting Park Ave., Philadelphia 29, Pa. The rippers are designed to fit tractor-bulldozer blades of any make and can be used for applications such as ripping frozen ground, rail roadbeds, rock and tree stumps.

complete line of HEAVY-DUTY cords helps you

PICK THE RIGHT CORD FOR YOUR JOB!

Now—Anaconda introduces new portable cords with rugged construction . . . peak performance . . . and top flexibility for 3 types of service!

Severe applications . . . Hard usage . . . Standard service – Anaconda brings you 3 new engineered cords designed with the exact physical properties needed for each type of job—strength, flexibility and resistance to wear!

Select the cord *best suited* to your needs—based on good engineering and sound economics.

Whichever cord you choose, the Anaconda trademark is your assurance of *premium performance.*

SECURITYFLEX—Underwriters' approved Types SO and SJO.

SECURITYFLEX* CORDS for severest conditions. Toughest, sturdiest cords made . . . used where strength and wear-resistance are a "must." Neoprene jacket *mold-cured in lead* gives top crush, abrasion- and oil-resistance. Cords pay for themselves with long life under severest conditions—in mines, railroads, docks, and in heavy industrial use. Look for the molded-in name, "Securityflex!"

INDUSTRIAL—Underwriters' approved Types SO and SJO.

INDUSTRIAL CORDS for heavy industrial conditions and *maximum flexibility.* Lower in cost. Specially designed for use in heavy industry—where cords are in continuous operation and must be tough, flexible, oil-resistant. Tough neoprene jacket. Many industrials stock this one cord for use in virtually all applications . . . reducing inventory problems and costs. Look for the Anaconda marking on jacket.

SERVICE—Underwriters' approved Types S and SJ.

SERVICE CORDS for regular duty. Lowest in cost . . . yet have many features found only in higher priced cords of other makes. Special rubber jacket withstands abuse and moisture. Outstanding for appliances, office machines, portable tools—where flexibility and long life are needed.

*Reg. U.S. Pat. Off. 55318

see the man from . . .

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PORTABLE CORDS

FREE "PORTABLE CORDS" BULLETIN

Anaconda Wire & Cable Company,
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Gentlemen: Please send me your new free "Portable Cords" bulletin, DM-5538.

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Clean-up work at Buckheart Mine No. 17, United Electric Coal Co.

Report on the MICHIGAN TURBO-DOZER:

New dozer features 27 mph speed, power-tilting bowl, rear-wheel steer

The new 2¾ yd. capacity Michigan Turbo-Dozer combines rubber-tired speed and mobility with outstanding traction and power. Its turbocharged diesel engine develops 165 hp, with maximum rimpull of 28,000 lbs. At 27 mph, it runs rings around any dozer on the market! The Turbo-Dozer can cover assignments from one end of the mine to the other. It runs on rubber from one job to another—shovel clean-up, dump, road maintenance jobs, cable relocation, miscellaneous towing.

Exclusive power-tilting bowl. A powerful double-acting hydraulic cylinder tilts the bowl back and forth through a 33 degree arc. With your right hand on the bowl-control lever, you can change the bowl angle from "dig" to "float" as you travel—clean up the surface of the seam without cutting into it. You can hook the cutting edge under tough rock or obstructions—work it up and down to root them out. If the front wheels have any tendency to rise, you can tilt the bowl back to build up the load weight *on* the bowl and front wheels.

High flotation tires, oscillating axle. Big 18.00-25 low pressure tires (nearly 7-foot tread) give the Turbo-Dozer excellent ground contact in dry, wet or sandy footing. You can cross railroad tracks or travel along the ties or road bed. On uneven terrain the steering-drive axle oscillates to keep both rear wheels in firm contact with the ground. With 14½ inches of ground clearance underneath, it's practically impossible to get "hung up".

Full traction while turning. The Turbo-Dozer gives you full tractive effort even in a turn. All four wheels are always driving, except when you declutch the rear axle for highway travel. Rear-wheel steering eliminates unnecessary tire wear —you don't brake or drag your inside wheels on a turn. If one wheel begins to slip, a locking differential automatically applies power to the wheel with the firmest footing.

Power-shifting, 300% torque multiplication. Clark's exclusive power-shift transmission eliminates the conventional engine clutch and foot pedal—the most notorious cause of excessive maintenance and operator fatigue. With two finger-tip levers on the steering column, the operator can instantly shift between High-Low and Forward-Reverse—even when moving in either direction—for fast in-and-out passes.

The 3-to-1 Clark torque converter gives you a steady power flow, regardless of speed. As the load gets heavier the torque output automatically increases up to 300% at stall speed—gives you the extra torque to plow through the toughest spots. You can't stall the engine, and there's no clutch to slip.

Prove it for yourself. The new Michigan Turbo-Dozer gives you faster cycles and more tonnage in every shift—more dollars of profit every day. Ask your local Michigan distributor to prove it; or write direct for detailed specifications. The Turbo-Dozer is available on the low-cost Michigan Lease Plan: no down payment, pay as it produces!

MICHIGAN is a trade-mark of Clark Equipment Co.

CLARK EQUIPMENT

CLARK EQUIPMENT COMPANY
Construction Machinery Division
482 Second Street
Benton Harbor 35, Michigan

In addition to having adjustable ripping depths and being adaptable to various size blades, the rippers have a removable ripping tooth and a one-man rack-and-pinion depth adjustment.

LAMINATED LADDERS—Ladders constructed of laminated wood side rails are said by the Engineering & Laminating Corp., Baltimore, Md., to be stronger than ladders constructed of solid wood rails. In building the ladder rails, hardwoods and cores of soft wood are glued to form the two rails.

BONDING MATERIAL—A bonding material with a high sheer strength of 2,500 lb has been developed by the Dasco Chemical Co., Inc., 1602 Thames St., Baltimore 31, Md. Named "Clinch-T," the material bonds new concrete to old and bonds plaster to "green" cement without waiting for complete curing. Dasco says the material can be applied over damp walls and is unaffected by humidity or condensation. It is also resistant to most acids and alkalies.

CENTRIFUGAL PUMP SYSTEM—Flood City Brass & Electric Co., Johnstown, Pa., has announced a new automatic system for operating centrifugal pumps. The system, which can be applied to any existing or new centrifugal pump installation, operates a centrifugal pump automatically and eliminates the need for vacuum pumps. Occasional maintenance and inspection are required.

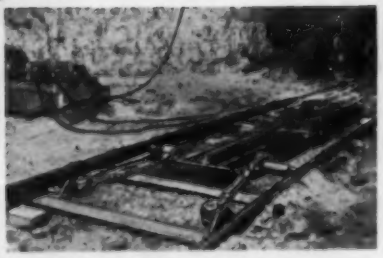
EXPLOSION-PROOF PANEL BOARD—Dust-tight panelboards, manufactured by Crouse-Hinds Co., Syracuse, N. Y., function either as load centers or panelboards and provide circuit protection on wiring systems up to 120 v, according to the manufacturer. Especially developed for hazardous installations where corrosive vapors, non-combustible dusts or moisture are present, the panelboards, type EWP, with circuit breakers are explosion-proof and dust-tight.

OVER 100 NOLAN PORTA-FEEDERS

NOW IN SERVICE!

TWO MODELS:

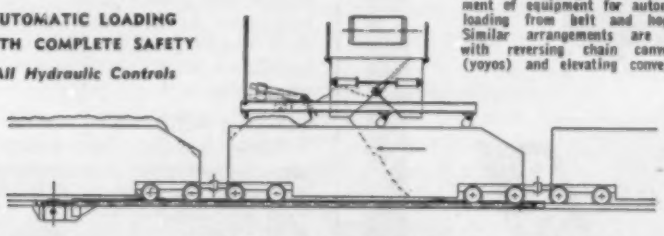
1. Direct Mechanical Drive
2. Hydraulic Cylinder Type Hose Coupled to Remote Power Unit (Shown in illustration at right)



These two Nolan models will help you meet every requirement and condition in spotting cars for loading . . . *and can save you many shift hours per day!* The Porta-Feeder mounts between the rails on top of the track ties, and is secured by rail clamps. No excavation or preliminary foundation work is necessary. There are no ropes or cables. Reciprocating pushing dogs deliver constant forward feeding motion.

AUTOMATIC LOADING WITH COMPLETE SAFETY

All Hydraulic Controls



The line drawing shows arrangement of equipment for automatic loading from belt and hopper. Similar arrangements are used with reversing chain conveyors (yoyos) and elevating conveyors.

The Nolan Porta-Feeder has been in successful use in many mines for over ten years. This modern method of moving cars has been accepted as the most efficient in the industry. Its ease of installation and quick movability recommends its use in any mine.

We will be glad to show you a mine in your vicinity where the Nolan Porta-Feeder is operating. Write us now.

NOLAN

THE NOLAN COMPANY

116 Pennsylvania St. • Bowerston, Ohio

Free Bulletins

FINE COAL DRYING—Dorr-Oliver, Inc., is distributing a bulletin, "Fluo-Solids Systems For Fine Coal Drying," describing the operation, theory and background of its fluidized coal dryer system. The bulletin reports operating results from the first commercial installation. The "Fluo-Solids" system for fine coal drying was designed to meet normal coal preparation plant requirements, according to the company, which adds that it comprises a two-compartment reactor, air heater, cyclone, feeder and blowers. Bulletin 7503, Dorr-Oliver, Inc., Barry Pl., Stamford, Conn.

ROOF-BOLTING DRILL—Bulletin C-50, offered by Joy Mfg. Co., Oliver Bldg., Pittsburgh 22, Pa., describes the company's new RBD-15 hydraulic rotary roof-bolting drill. The 15-hp unit, according to the bulletin, drills wet or dry, tightens bolts and, without a gear shift, permits variable combinations of thrusts to 5,500 lb at 1,050 psi, feed speeds to 60 fpm, rotation speeds to 650 rpm and torques to 240 ft-lb. All-hydraulic and self-powered, the four-wheel drive RBD-15 turns in its own length (114 in), trams at 108 fpm and weighs 4,250 lb. Its single basic chassis is offered in heights of 33 in with 6-in ground clearance, or 37 in with 10-in ground clearance.

LIMIT SWITCHES—A folder describing lever and rotating cam-type limit switches is being distributed by the General Electric Co., Schenectady 5, N. Y., Bulletin GEA-613A contains application information, product features, ratings, dimensions and book prices. It also includes lever-operated snap-action; small oil-tight snap-action; lever-type double-circuit; rotating cam; and lever-operated slow-make-and-break limit switches.

ALUMINUM TRAILERS—"The Road to Payload Profits," a 50-p booklet printed by the Aluminum Co. of America, analyzes advantages said to come from aluminum constructed truck-trailers. Reports from fleet owners and operators fill most of the booklet. Alcoa, 771 Alcoa Bldg., Pittsburgh 19, Pa.

HOSE COUPLING—A revised catalog describing its "Quick-Seal" line of quick connecting-disconnecting hose couplings has been printed by Titeflex, Inc., 10

SuperDuty

It's Time to Check Your Fine Coal Cleaning Equipment

Are you getting full recovery of high grade washed coal fines at the lowest possible cost?

Modern SuperDuty® DIAGONAL-DECK® Coal Washing Tables are providing all that and more for an ever increasing number of operators.

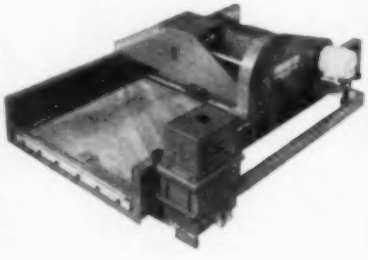
It makes no difference whether you are cleaning coal for metallurgical, steam or domestic use. It makes no difference whether you are a small operator requiring but one or two tables or whether your big tonnage requires a hundred units. Economics under any and all conditions have proved SuperDuty table cleaning to be unequalled.

Check your cleaning equipment performance and costs today. Old equipment and processes can be profitably replaced by modern SuperDutys.

Send for Bulletin 119.

FOR SCREENING ECONOMY

New Model E Leahy screens are as clean cut in design as the phenomenal performance they are recording. When dust is a problem, totally enclosed models are available. Even on damp screening, new FlexElex electric heating of the screen jacket insures full-time open mesh. For wet screening CONCENCO® spray nozzle arrangements are added.



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CONCENTRATOR
COMPANY
903 Glasgow Ave. • Fort Wayne, Ind., U.S.A.
CONCENCO PRODUCTS

★ *The ORIGINAL Deister Company* ★ *Inc. 1906*

Hendee St., Springfield 4, Mass. "Quick-Seal Couplings" features page-size views of a sealing action that makes a coupling tighten as internal pressure increases. Also described are single-check and double-check valve modifications that seal off one or both ends of a fluid line the instant the coupling is disconnected.

BATTERY MANUAL—A 48-p manual on lead-acid batteries for all types of motive power application has been printed by C & D Batteries, Inc., Washington and Cherry Sts., Conshohocken, Pa. The manual covers industrial cycle service, including mine locomotives, and discusses methods, maintenance, repair, theory of operation, instructions covering repairs with regular or special tools, simplified testing methods, acid-handling precautions and correct charging methods.

ASBESTOS SHEET PACKING—A new data sheet describing compressed asbestos sheet packing has been printed by The B. F. Goodrich Co., Industrial Products Div., Akron, Ohio. Specifications and uses of 11 grades are given. A variety of grades includes high rated sheets for severe conditions, synthetic bonded types, neoprene and "Hycar," where oil and solvents are involved and a general purpose grade.

DRYING PROCESS—A bulletin describing "turbulent entrainment," a hot gas drying process, is being distributed by the manufacturer of the Parry Dryer, Silver Engineering Works Inc., 3309 Lake St., Denver 5, Colo. The bulletin explains the fundamental principles of the Parry Dryer, control temperatures and high rates of heat transfer that remove surface and inherent moisture.

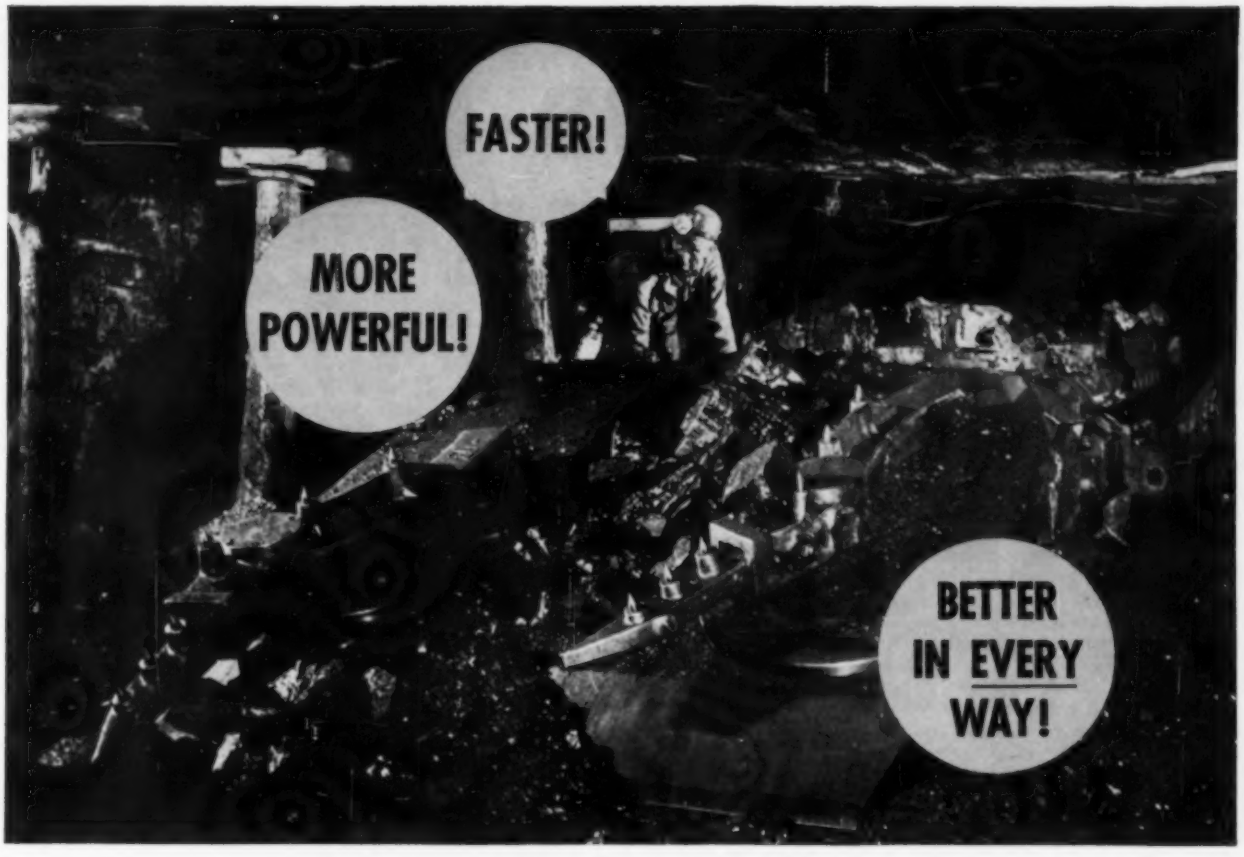
TURBOCHARGING—Questions and answers about turbocharging are featured in a 16-p booklet by Cummins Engine Co., Inc., Columbus, Ind. The booklet describes a turbodiesel and how it works. The company manufactures five "Turbodiesels," the 175-hp JT-6, the 250-hp NT-6, the 262-hp NTO-6, the 300-hp NRT-6 and the 600-hp VT-12.

PLASTIC PIPES—Bulletin 24, distributed by National Tube Div., U. S. Steel, Pittsburgh, Pa., describes two types of polyvinyl chloride, or plastic pipe: high impact and normal impact. The pipes' resistances to chemicals and weather, their weights, rigidity and methods of installation are reviewed in a section on properties.

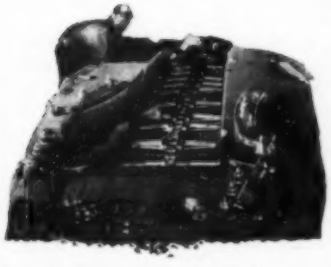
CUSTOM EQUIPMENT—Methods and facilities for constructing custom equipment to customer's engineering requirements are described in a brochure by Fritz W. Glitsch & Sons, Inc., P. O. Box 6227, Dallas, Tex. According to the brochure, the company will begin with a rough sketch to manufacture products that are suited to forming, bending, drawing or welding, from heavy plate to sheet metal gage in single or large lots.

MOTOR SCRAPER—Engineering, design, construction and mechanical features of

(*Continued on p 162*)



JOY *SUPER* 14-BU LOADER



Performance—coupled with unrivaled simplicity of design and durability in service—made the 14-BU the world's most widely used loader in medium-low coal. Now, in the SUPER 14-BU, performance has been stepped up even higher . . . the machine can get in and out faster, load more coal and stay on the job better than ever before.

For example, horsepower is increased from 40 to 65 HP. Peak loading capacity is stepped up 20%, and the high tramming speed almost 50%. All mechanical and electrical components have been beefed up to match the oversize horsepower motor, and reduce maintenance costs. The conveyor chain speed is increased to more than 300 FPM—up about 30%—and the chain itself has 45% greater tensile strength. The loader actually weighs about 900 lbs. more, but heights are unchanged at 30½", 33" and 36".

Add extra advantages like those to Joy's famous gathering mechanism and exclusive Magnetax control—features that have been field-proved in every coal mining area in the world—and you have the kind of easy-operating, heavy-duty, high production loader that means increased tonnage and reduced costs for you. ● Let us show you what SUPER 14-BU Loaders or other Joy Mechanized Equipment can do to improve your profit margin! ***Joy Manufacturing Company, Oliver Building, Pittsburgh 22, Pa.*** In Canada: *Joy Manufacturing Company (Canada) Limited, Galt, Ontario.*

Write for FREE Bulletin 29-1

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NEWS ROUND-UP

NCA Adopts Policy On Nuclear Energy

The directors of the National Coal Association last month adopted a resolution on atomic energy which, Tom Pickett, executive vice president of NCA said, "recognized a need to continue government sponsorship of the development of nuclear energy. Drafted by the NCA's Atomic Energy Committee, the resolution called for economic nuclear power for undeveloped world areas and proclaimed that in the United States the competitive stimulus of free enterprise would bring about the most beneficial results from all energy sources, coal, oil, natural gas or atomic energy. The resolution warned against early optimism over low-cost nuclear power very soon and called for the national laboratory to direct its efforts toward lowering atomic energy processing costs and increasing the safety of reactor systems.

Mr. Pickett said that the 500-word statement on atomic energy policy had been adopted by an overwhelming vote of NCA's 46 directors. "The coal industry," Mr. Pickett said, "furnishes 65% of the fuel used in the generation of electric power in the United States. On that record and our experience, we believe we are justified in discussing some aspects of our government's public policies on atomic energy which have before this received too little attention. We believe our position is reasonable, worthy of support of all the American people."

Text of the NCA resolution, p 128.

Tennessee Strike Settled As Pay, Prices Are Hiked

Except for a small number of operators, most mines in Tennessee's Chattanooga coal field had begun operating again last month. Strike-bound since Sept. 6 some 5,000 miners returned to work after 200 independent operators had granted a $1.20 a day pay rise and $40 more vacation pay annually.

Although the 2-mo strike was directed against the operators, the main target was the Tennessee Valley Authority and its coal buying policies. From the beginning the operators, most of them coal subcontractors, had been willing to pay the raise but said they could not stay in business unless they themselves were granted a 40c a ton sales price increase by the Tennessee Products and Chemical Corp. and Tennessee Consolidated Coal, two suppliers of coal for TVA's Widow's Creek steam plant in northern Alabama. The two major companies had already granted their own miners the pay hike. Replying to the independent operators' demand for a sales price increase, the two said they could not pay 40c a ton because TVA had said it was permitted to pay only 12c a ton more to companies "for general wage increases or other changes in the cost of mining coal."

When TVA's coal reserves dropped to 30-day supply against a normal 60, TVA began bringing in coal by barge from western Kentucky. Faced with the possible loss of being TVA coal suppliers, the two major companies offered their independent subcontractors 20c a ton.

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Oil Import Cutback Seen If Voluntary Curbs Fail

After urging oil companies in October to voluntarily reduce crude oil imports by 7% during this quarter, Defense Mobilizer Arthur S. Flemming last month followed through with the warning that he would suggest government curbs if the voluntary plan failed. Mr. Flemming made the statement before the Anti-Trust Sub-committee of the House Judiciary Committee. Its chairman, Representative Emanuel Celler (D-NY), had criticized the call for voluntary curbs and charged that Mr. Flemming had ignored the will of Congress by not seeking to establish months ago a government regulation to curtail oil imports.

Defending his move for voluntary cutbacks, Mr. Flemming said, "I was justified in seeking voluntary action before launching the government down a road of regulation which it had never traveled before. It was, and is, my duty to use extreme care in a field as new as that which would be opened by government quotas." But Mr. Celler contended that the ODM director "knew oil imports were mounting and that under the Reciprocal Trade Agreements Act passed this year it was your duty to ask the President to order a quota on such imports."

Mr. Flemming's call for voluntary curbs was mainly directed at oil being imported from the Middle East. In a letter mailed to 24 oil companies, he excepted imports from Venezuela and Canada. And although half the United States crude oil imports of some 740,000 bbl a day are shipped from Venezuela, Mr. Flemming said that that country had agreed to limit exports to the United States. Canadian imports, he said, were left unfettered because oil from that area has been shipped chiefly to the northwest section of this country where a shortage of oil supplies exists.

FPC Examiner Recommends Larger Gas Volume Sale

A Federal Power Commission examiner has decided that larger volumes of natural gas may be sold by the Transcontinental Gas Pipe Line Corp. to the Duke Power Co. for use as boiler fuel. The examiner's decision, subject to review by the full Federal Power Commission, was based on the assertion that although the increased use of natural gas would displace coal, the benefits to Transcontinental Gas Pipe Line and Duke Power outweighed disadvantages to both coal and to rails.

In his opinion the examiner said that disadvantages to mine owners and workers had not been established with certainty and that other sales of coal may more than make up the difference.

The examiner refused to consider conservation as a factor because, he declared in his decision, Congress had not established a conservation policy "relating to or controlling the utilization of gas or oil or coal." Until Congress establishes such a conservation policy, the examiner said, conservation will not be considered.

Low Fossil Fuel Costs Seen As Atom Power Bar

Cheap atomic power that would be able to compete against the low price of conventional fossil fuels was a long way off, two speakers at the National Industrial Conference Board's 4th annual conference on Atomic Energy in Industry indicated to their audience in New York.

W. Kenneth Davis, director of the Div. of Reactor Development, Atomic Energy Commission, said that since predictions for the future are founded on

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cost estimates and that no actual cost experience is available today, "we have a very large amount to do before we can talk about economic nuclear power, much less low-cost nuclear power."

James H. Harlow, a mechanical engineer for the Philadelphia Electric Co., pointed out that nuclear plants would be built only if they were able to compete, dollarwise, against conventional fuel plants. He added that there was no reason to expect radical fuel bill changes simply because the power source was nuclear. Conventional fuel bills were so low, he said that successful nuclear power would have only the slightest impact on the electric bill of the consumer.

Lord Citrine, chairman of Great Britain's Central Electricity Authority, told the conference audience that England was rigorously developing nuclear power because its coal shortage, now 5- to 6,000,000 tons a year, may grow to 10- or 11,000,000 tons by 1965. He said the United States was blessed with vast resources of coal.

Another speaker, Canadian economic consultant John Davis, said that Canadian resources were sufficient for conventional power except in Ontario, where power stations would import United States coal.

Text of The NCA Resolution

"BE IT RESOLVED, by the Directors of the National Coal Association, that the following facts and principles should be considered by the Executive Branch of the Federal Government, the Members of Congress, the Atomic Energy Commission and the American people, in determining the role of the Federal Government in the development of atomic energy:

I. In the progression of humanity, in furthering world trade, in advancing the cause of peace, and in maintaining the world leadership of the United States, there is a need to continue government sponsorship of the development of nuclear energy. To this end, the National Coal Association recognizes the need for the Government to support the national laboratories and to carry out the basic as well as applied research in the field of atomic energy.

II. Future development of economically feasible nuclear power is necessary to provide power for underdeveloped areas of the world, to assist nations which have power shortages, and to protect the future of the United States in the power field. The National Coal Association therefore recognizes the need for the Government to continue the power demonstration program to optimize the conditions under which atomic power is generated.

III. The public interest requires that atomic energy be utilized principally in whatever ways or processes it will contribute efficiently to the energy requirements of the United States and the world. The conversion of solid fuels to gas and to liquid fuels through the utilization of atomic energy promises great benefits to the people of the United States. The national laboratory effort should be directed toward minimizing atomic energy fuel processing costs, increasing the safety of reactor systems against public hazards, and developing high temperature materials of construction to the end that all sources of energy will receive their fair share of the total effort to progress.

IV. The United States is one of the few nations of the world blessed with sufficient reserves of fossil fuels to meet the nation's power requirements at low cost for centuries to come. In the United States the most economic source of steam-generated electric power in the foreseeable future will be plants fueled by coal, oil or natural gas. Under the competitive stimulus of our free enterprise system, the ingenuity of the American people will bring about the most beneficial results that can be obtained from all energy sources, including coal, oil, natural gas and atomic energy.

V. The public interest demands dissemination of actual cost information with respect to nuclear fuels to the greatest extent compatible with national security. To the extent that government subsidies are necessary in the development stages of the nuclear program, the public should be informed as to the magnitude thereof. There can be no reliable forecast of the comparative costs of power generation until nuclear fuel costs, and the cost of the safe disposal of radioactive wastes, are established.

VI. The nation's best interests are not served by unwarranted optimism about the early availability of low-cost nuclear power."

News Briefs

W. Kentucky Leases Strip Holding 45,000,000 Tons

In Kentucky last month the West Kentucky Coal Co. announced it had bought coal rights and leases on 12,500 acres of land in Union County from the Truax Traer Coal Co., Chicago, Ill. The land, situated on the Ohio River below Uniontown, Ky., contains some 45,000,000 tons of recoverable No. 9 coal, according to Mark Eastin Jr., an executive vice president of West Kentucky.

Mr. Eastin said that the land would be used in a future development of waterborn coal.

Sprague Buys Control Of Gulf Smokeless Coal

A few weeks after it had bought two West Virginia coal companies (MacAlpin Coal and Winding Gulf Collieries), Gulf Smokeless Coal Co., Tams, W. Va., announced it had sold control of all its properties to C. H. Sprague & Son, Boston, Mass., for several million dollars.

W. P. Tams Jr., president of Gulf Smokeless, said the Sprague company, one of the largest coal sales firms in the nation, took over operation of the properties Nov. 1.

Included in the sale were the Tams No. 2 mine at Tams; MacAlpin Mine at MacAlpin, W. Va.; Winding Gulf No. 4 Mine at East Gulf, W. Va.; Lamar Mine and Louisville Mine, Goodwell, W. Va.

The mines produce some 125,000 tons of coal a month. An additional 30,000 is produced through strip mining. Some 1,500 acres of property containing some 50,000,000 tons of coal were involved in the sale.

Eastern Gas & Fuel To Open W. Virginia Mine

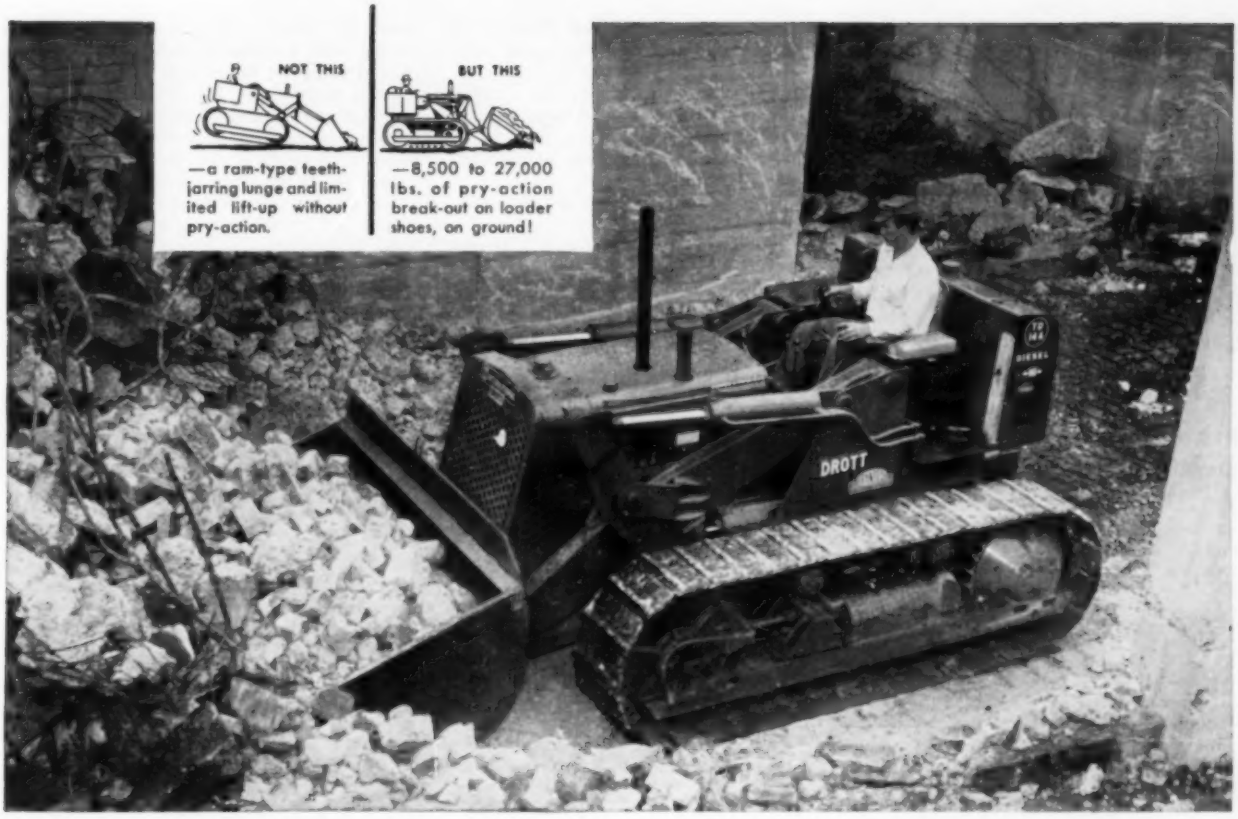
Eastern Gas & Fuel Associates disclosed last month that its Coal Div. had begun preliminary construction of a new mine situated in Helen, W. Va. The mine, named Stotesbury No. 10, was expected to begin producing early in 1956.

The company said that it would be one of its most completely mechanized operations and should produce 1,500 tons a day. No cars will be used in the mine except to carry supplies and personnel. Loading machines will transfer coal at the face to conveyor belts that will carry the coal to a cleaning plant.

The operation will cut coal from the Pocahontas No. 4 seam, a seam already being mined by the company's Stotesbury No. 11 operation. Eastern Gas & Fuel's last new mine, Wharton No. 2, Barrett, W. Va., was opened in 1948.

U. S. Steel Mine Closure To End Span of 73 Yr

One of U. S. Steel's oldest coal mines, Leisenring No. 2, W. Leisenring, Pa., was slated to be shut down Dec. 31 and end operations that had spanned 73 yr. The company said that the mine contained only a small amount of coal that prohibited safe shaft operations. And, because it was rapidly exhausting what coal it was able to mine, U. S. Steel began laying off some of its 230-man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Pry-action's tremendous yardage-getting force breaks compacted or frozen soils—lifts out embedded rocks—yanks up "anchored" materials. Also, this great *hydraulic pry-out power over big skid-shoes* shunts stresses directly into the ground—instead of to bucket, track frames, and final drives!

And only an International Drott has the shock-swallowing protection of Hydro-Spring. This exclusive "impact-cushion" reduces the consequences of shock forces to operator and tractor by 67% or more—besides increasing production and eliminating most hydraulic hose failures! Owners credit this feature, alone, with boosting loader-tractor life a whopping 25 per cent!

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News Briefs (*Continued*)

working force of miners in November.

Leisenring No. 2 is one of three mines (Leisenring No. 1, No. 3) situated in an 8,900 acre coal field that was opened in 1882 by the Connellsville Coke & Iron Co. The field was named after the company's president, John Leisenring. In 1890 the properties were acquired by the H. C. Frick Coke Co.

Thus far the field has produced 33,000,000 tons. Estimates that some 5,000,000 tons remain indicate that production will continue for at least four more years.

Standard Oil (N. J.) Plans $1,200,000,000 Expansion

Standard Oil of New Jersey announced last month it would spend $1,200,000,000 on expansion in 1956. The company, the world's largest oil firm, said that half the money (some $1,000,000,000) would be spent on exploration and development, a quarter of it would be spent on refining and the remainder on transportation and marketing. Some 85% would be spent in the western hemisphere (43% in this country) and 15% in Europe and Africa. Standard Oil of New Jersey has invested $6,000,000,000 for expansion and exploration since World War II.

Coal Chief Attraction For New Ohio River Plant

The Olin Mathieson Chemical Corp. disclosed last month that it would establish an aluminum reduction plant in the Ohio River valley. The company said the chief attraction in the area was the availability of coal as a source of power. It has, however, yet to decide whether to supply the needed power itself, to tie-up with a coal or utility company or to buy the power from a utility company.

Olin admitted that it had talked with officials of American Gas & Electric Co. and with Pittsburgh Consolidation Coal Co. A company spokesman said that coal would definitely be cheaper than trying to use hydro-electric power. Pittsburgh Consolidation, it was reported, is interested in getting into the business with St. Joseph Co. on a joint ownership basis.

Slate Equipment, Glamour For Bluefield Coal Show

More than 325 manufacturers and industries are expected to spotlight their newest machinery and equipment at the biennial Southern Appalachian Industrial Exhibit, or the Bluefield Coal Show, Bluefield, W. Va., May 23-25. James B. Wooldridge Jr., assistant secretary of the Pocahontas Operators Association and director of the show, said last month that 30 states would be represented and that all booth space would be completely sold by mid-December.

Some 58,000 persons turned up at the 1954 exhibit when more than $20,000,000 worth of equipment and machinery went on display.

During this year's show, the Pioneer Miners, a club of men that have worked in and around coal mines for 40 yr without losing time because of an accident, will hold a reunion.

And for glamour the show's sponsors, Pocahontas Electrical & Mechanical Institute, says Queen Bituminous XIII and a court of queenly attendants will be selected.

The show's officers are: H. E. Mauck, general manager of the Olga Coal Co., Coalwood, W. Va., chairman; W. L. Osborne, general manager of the Algoma Coal & Coke Co., Algoma, W. Va. vice chairman; and Mr. Wooldridge, director.

Coal Industry Paying Car Upkeep Costs, NCA Charges

The National Coal Association's Transportation Dept. estimated last month that the coal industry will spend more than $4,000,000 during 1955 for cleaning and repairing railroad equipment. The NCA based its estimation on replies from a questionnaire that it sent to coal shippers. It said, on the basis of returns, more than 71% of the cars furnished to mines during Aug. 22 to Sept. 3 required cleaning or patching at an average of 55.4c a car. It said the response to its questionnaire "represented a substantial sample of total cars furnished and loaded" between Aug. 22 and Sept. 3.

Railroads Boost Orders to 30,482 Hopper Cars

Railroads began responding to coal producers' pleas for more coal hopper cars with a 20,000-car rush of orders during October and November. On Oct. 1, the railroads had ordered a total of 10,832 new cars. Since then more than 20,000 additional cars have been ordered.

The biggest boost was announced by the New York Central. It ordered 9,250 cars of 70-ton capacity last month. The Pennsylvania was reported moving up its 2 000-car order to 4,800 and the Norfolk

(*Continued p 132*)

Personal Notes

A. E. Southgate, treasurer and credit manager of the Philadelphia & Reading Corp., was elected vice president of production control at an Oct. 28 meeting of P&R's board of directors, according to an announcement last month by Edward G. Fox, president. Mr. Southgate had served as credit manager for P&R and its predecessors since 1929. In 1941 he was elected treasurer. To fill the two vacancies left by Mr. Southgate's boost to a vice presidency, P&R's board elected **C. H. Klasner,** who added the duties of treasurer to his own of company controller. Then the board boosted **William E. Gabbott** from assistant credit manager to credit manager.

The *Safety Commentator,* a publication of the Hudson Coal Co., Scranton, Pa., disclosed last month that **Harry H. Otto,** assistant general manager, had retired after 30 yr service. Mr. Otto joined Hudson Coal in 1925 after working for the Lehigh Valley Coal Co. and the Lehigh Coal & Navigation Co. He was appointed assistant general manager in charge of engineering in 1944.

Purchasing agent and labor relations expert **R. J. Hepburn** has been elected vice president in charge of operations by the directors of the United Electric Coal Cos., according to an announcement by Frank F. Kolbe, president. The same announcement reported that **John J. Huey** was put in charge of all machinery design and maintenance.

L. Guy Walter, assistant superintendent of the Blue Diamond Coal Co. Mine No. 1, Leatherwood, Ky., had succeeded **Noah Mayhew** as superintendent.

Mack McCormick, Jenkins, Ky., formerly associated with The Consolidation Coal Co., Jenkins, has developed a truck mine on a small coal area near the Hendrix, Ky., plant of Consolidation Coal. The coal will be trucked to a tipple at Hendrix.

Carl S. Westerberg, former general superintendent of the old Utah Fuel Co.'s Sunnyside and Castlegate coal mines, has been named assistant general manager for Heiner Coal Co. Westerberg returns to Utah from Chicago, where he was employed by the Link-Belt Co.

Coal Customers Get Car Shortage Reminder

One method of meeting the current railway car shortage was demonstrated last month by the Island Creek Coal Sales Co., Huntington, W. Va. The company began attaching red, white and blue stickers to every shipping order, reminding its customers that they can help improve service by unloading railway cars promptly.

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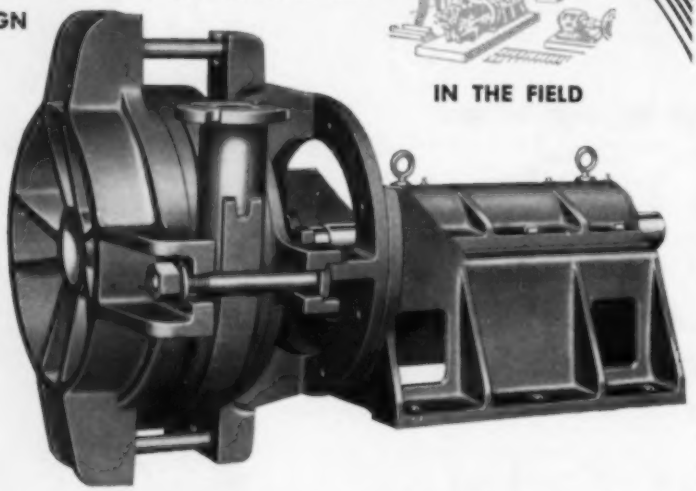

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News Briefs

(*from p. 130*)

& Western from 2,000 to 4,000. Others followed with increases until the total number of cars on order stood at 30,482.

Only one catch remained to gnaw coal producers. Most of the cars could not be delivered before late summer or fall, 1956.

Appeals Court Sets Aside Mine Gas Violation Report

A U. S. Sixth Circuit Court of Appeals last month set aside a federal mine inspector's contention that the Princess No. 2 mine, owned by the Princess Elkhorn Coal Co., David, Ky., contained too much gas for safe operation. The decision was believed the first in which a federal mine inspector's report has been overthrown. The inspector had found 0.27% methane in the mine's air and ordered the company to comply with the lawful 0.25% safety margin. After being denied relief by the director of mines, the coal company appealed to the Federal Coal Mine Board of Review which argued before the court that air samples had not been taken in accordance with law and that they had been taken less than 12 in from loose machine cuttings. The Court upheld the Board's interpretation that the term "face" included loose or broken coal.

And For Your Information . .

The Tennessee Valley Authority last month awarded contracts for 3,558,856 tons of coal valued at $10,389,483. The coal was for the Colbert steam plant in north Alabama, the Johnsonville steam plant in west Tennessee, the Shawnee steam plant in west Kentucky and the

Bituminous Coal Output Still Climbing

YEAR TO DATE	PRODUCTION
Nov. 12, 1955	399,094,000 tons
Nov. 13, 1954	334,149,000 tons

1955 output 19.4% ahead of 1954.

A month earlier, through Oct. 16, 1955, output was 20.5% above 1954

WEEK ENDING	PRODUCTION
Nov. 12, 1955	9,810,000 tons
Nov. 13, 1954	8,861,000 tons

Anthracite Steady

YEAR TO DATE	PRODUCTION
Nov. 12, 1955	21,197,000 tons
Nov. 13, 1954	22,947,000 tons

1955 output 7.6% under 1954.

A month earlier, 1955 output was 7.7% under 1954

WEEK ENDING	PRODUCTION
Nov. 12, 1955	565,000 tons
Nov. 13, 1954	624,000 tons

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USS TRI-TEN STEEL gives you high strength plus high resistance to impact at low temperatures. This tough, versatile steel is ideal for use in heavy-duty equipment which must operate in subzero weather. For it retains its toughness and withstands shock under low temperature conditions. Will keep your shovels, draglines and 'dozers going when others fail.

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USS MAN-TEN STEEL gives you high strength plus resistance to abrasion. This lower-cost grade has a higher resistance to abrasion than carbon steel. In addition to high strength and toughness, it has workability and weldability to a higher degree than obtainable in carbon steel at the same strength level.

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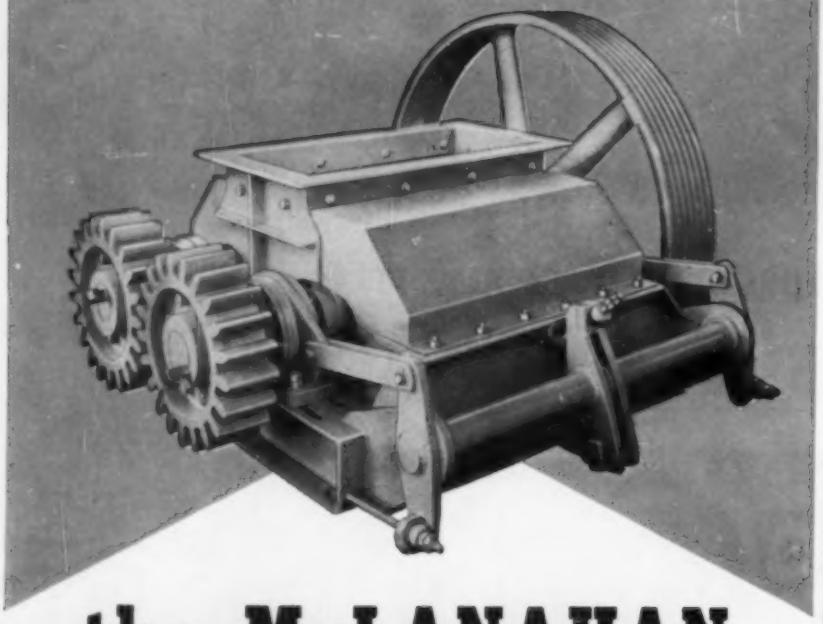

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Kingston and Watts Bar steam plants in east Tennessee.

Billions of tons of low grade coal on the Navajo Indian Reservation in Northeastern Arizona is attracting attention of several major corporations—whom the tribal council declines to name, but admits are conducting exploratory work.

Southern railroads, meeting in Atlanta, Ga., last month declined to join western and eastern carriers in seeking a 7% rise in freight rates, according to J. G. Kerr, chairman of the Southern Freight Association. But he added that the way had been left open for the lines to reconsider.

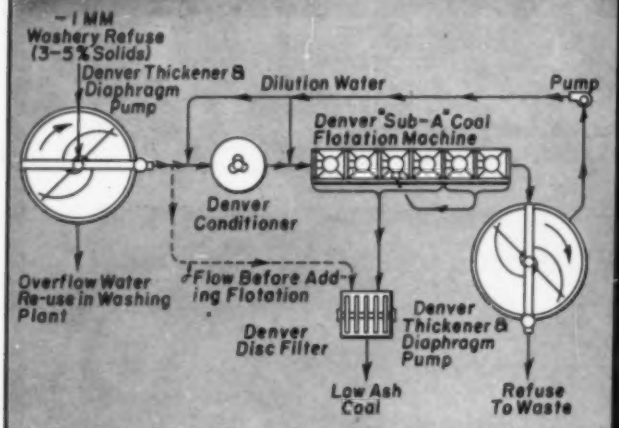
R. Livingston Ireland will receive the Erskine Ramsay Gold Medal for coal mining. "For his vision, energy and consistent belief in and leadership of the American coal industry." Mr. Ireland is chairman of the executive committee of Pittsburgh Consolidation Coal Co., Cleveland office.

Around The World

There is little likelihood that the British will reconsider an order to cut back coal exports in 1956, despite pressure from the European Coal and Steel Community. This means the ECSC will have to find another 10,000,000 tons of coal imports. For American producers the British decision and the ECSC quandary means this: M. Rene Mayer, president of ECSC, will journey to Washington early next year to seek a firm American commitment to supply a minimum quantity of coal each month during 1956. Without this there is danger that European industrial production will be held up next year.

British coal union leaders warned the National Coal Board last month that a new wage claim would be made this month, probably Dec. 8. The National Union of Mineworkers has already submitted a "Four-Point Charter" calling for a third week's holiday with pay, a seven-hour day for underground men and a 40-hr week for surface workers. Other claims ask payment during sickness and consolidation of bonus shift payments into the day wage.

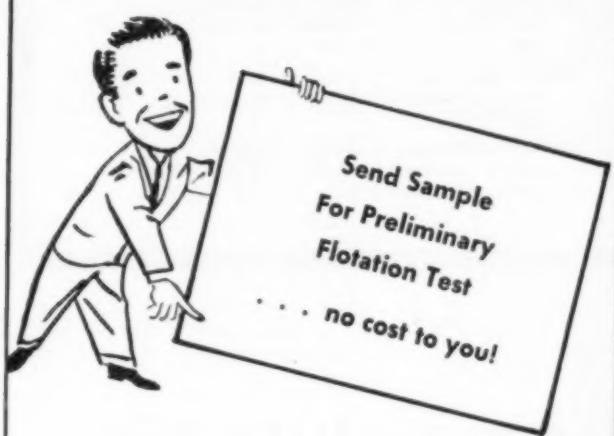
West German coal traders, fearing a coal shortage this winter, have asked the Ruhr mining industry to work extra shifts. But a spokesman for the miners' union said the unions would reject the request because it might make coal mining appear more unattractive and miners might lose even more men than in past months. Coal traders expect scarcities of coal, especially in household grades. Industry, however is not as worried. Dr. Henrich Kost, a leading man in the West German coal industry, says that "no serious" shortage is expected. He said that if the winter weather was normal supplies should be adequate except in certain grades. According to reports from Bonn, German imports of coal

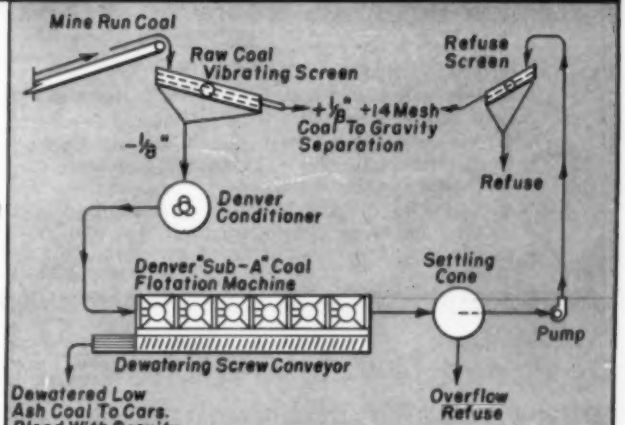


Extra Profits From Washery Refuse — Adding flotation to treat minus 1 mm coal fines, ahead of filtration, effectively lowered ash and sulphur to meet market requirements.

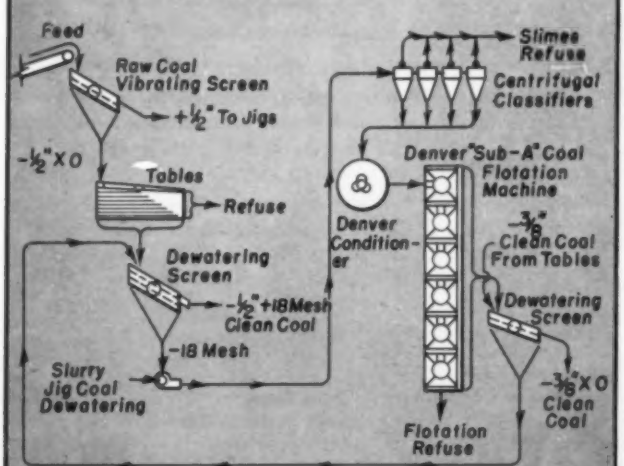
Three Simple Coal Flotation Flow Sheets

. . . How can you apply them to your plant to increase profits?





Extra Profits From Mine-Run Coal—Coarse coal fines —⅛" floated and readily dewatered in flotation circuit with inexpensive screw conveyor arrangement.



Extra Profits From Fine Coal—In this plant, flotation lowered ash to 3.5%, concentrate dewatered on vibrating screen along with coarse coal from table section.

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Wherever you are . . . it costs you nothing to find out what Denver Coal Flotation will do for you. Coal fines above ground can be extra money in the bank. Send your sample, today!

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We are sending a 25 pound sample of coal fines for a Preliminary Coal Flotation test, at no cost to us.

Name.....

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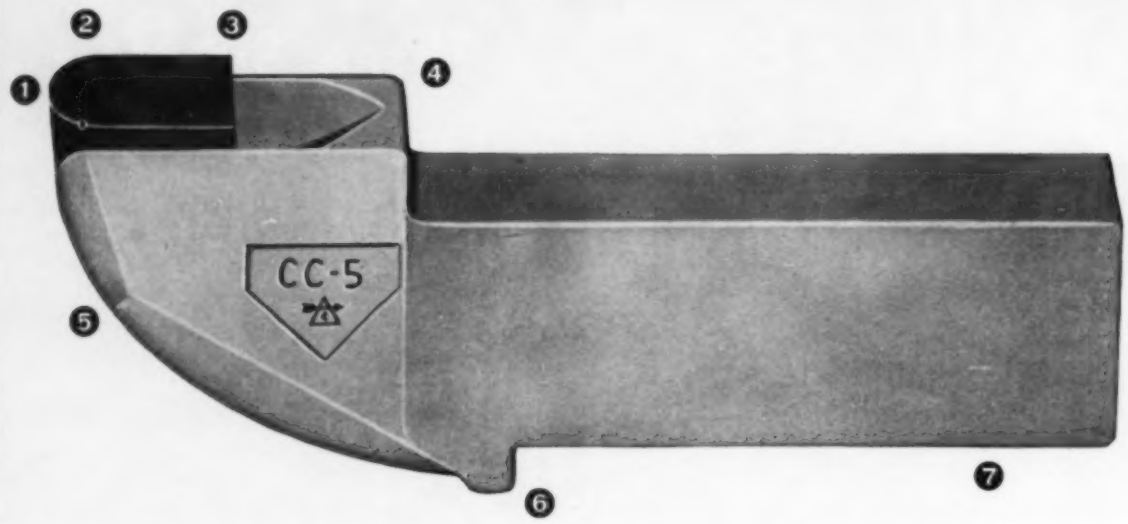

1 **Easier, faster grinding.** Less carbide surface to grind means lower maintenance costs.

2 **Side wear eliminated.** Full-width tip protects shank sides during cutting action.

3 **Stronger braze.** Exclusive V-shaped tip and recess supply maximum brazing area; permit stronger bond.

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The heavy-duty CC-5 reduces minus ten mesh coal production . . . yet cuts smoother and more freely. It reduces maintenance costs because it requires less bit changing, and sharpens faster.

The exclusive V-shaped tip and recess provide 40% more holding power for the carbide, eliminating premature tip breakage. The carbide in the CC-5, as in all Carboloy Mining Tools, outlasts steel by up to 50 times; increases tonnage from 20% to 30% per shift.

The CC-5 heavy-duty bit is designed for all continuous miners and cutting machines using standard ½" or ¼" bits. It is also available with a ¼" hole in the shank, for locking-pin installations.

Get immediate delivery on the CC-5, or any of the complete line of Carboloy Mining Tools, from your local Authorized Carboloy Mining Tool Distributor (he's listed on the opposite page). For price lists, specifications, or expert assistance on carbide mining-tool applications, call him today.

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Carboloy Created-Metals for Industrial Progress

exceed exports. More than 1,000,000 tons has been bought from the United States.

Saar coal output in October totalled 1,463,000 tons compared with 1,450,000 in September. Sales aggregated 1,258,000 tons, including 338,000 tons to West Germany and 105,000 tons to other countries.

French coal output increased to 4,938,000 tons in October compared with 4,558,200 tons in September, the French Coal Board has announced.

Netherlands blast furnaces and steel factories have increased coke production from 1,200 to 1,800 tons a day and their gas output from some 300,000 to some 600,000 cu meters a day. This has been done by building two coke batteries at a cost of $8,000,000. The gas will be supplied to the city of Amsterdam and several other municipalities. A report from the Netherlands last month said there was "an increasing necessity to import large quantities of American coal."

The Burmese government will shortly sign a contract with the English firm of Powell Duffryn, of Glamorgan, for the exploitation of Kalewa coal field, 470 mi northwest of Rangoon. The Burmese government hopes to mine 60,000 tons next year from the coal field, which is near the Indian frontier. The government also plans to increase production to 300,000 tons by 1959. The coal field has not been exploited before, because it lies more than 100 miles from the nearest railway line and in hilly terrain. Powell Duffryn's will be responsible for designing and installing all plants in addition to operating the mine, Rangoon reports said.

Obituaries

Watson Storey, 55, mining engineer at the U. S. Steel Corp. mines, Lynch, Ky., died Oct. 22 in Notre Dame Hospital, Lynch. Mr. Storey had been a resident of Harlan County since 1930 and was a member of the Lynch board of education when he died. Before joining U. S. Steel he had been a mining engineer for the H. C. Frick Co., Scottdale, Pa. He was born in Irwin, Pa., and was a member of the American Institute of Mining and Metallurgical Engineers, the American Mining Congress and the Kentucky Mining Institute. Funeral services were held in the Lynch Methodist Church, Ky. Burial was at Big Stone Gap, Va.

Paul E. Henise, 67, Johnstown, Pa., died Oct. 29. Well-known among Pennsylvania mining men, Mr. Henise had been president of the Argyle Coal Co. and had been associated with the Mineral Point Coal Co.

Andrew Jackson McCartey, 60, superintendent, Wisconsin Nos. 1 & 2 mines, Benham, Ky., died suddenly November 11 while attending the Kentucky Mining Institute meeting at the Phoenix Hotel, Lexington, Ky.

Preparation Facilities

Pocahontas Fuel Co., Mine No. 7, Jenkinjones, W. Va.—Contract closed with Daniels Co., Contractors, Inc., Indiana, Pa., for complete new preparation plant including a DMS Dense Media System for preparing 8x¼ ROM coal from the Pocahontas No. 3 seam.

Pocahontas Fuel Co., Boissevain Mine, Boissevain, Va.—Contract closed with Daniels Co., Contractors, Inc., Indiana, Pa., for new preparation facilities including a DMS Dense Media coal washer for preparation of 8x¼ ROM coal from the Pocahontas No. 3 seam.

R.B.M. Long, Pty., Ltd., N.S.W.—Contract closed with Deister Concentrator Co., Fort Wayne, Ind., for one SuperDuty Diagonal-Deck No. 7 coal washing table for cleaning 3/16x200 mesh coal.

Northwestern Improvement Co., Roslyn, Wash.—Contract closed with McNally Pittsburg Mfg. Corp. for one McNally automatic fine coal jig for processing 75 tph ¼x0. To be installed in addition to existing cleaning facilities at Wilkerson Mine.

Roslyn-Cascade Coal Co., Ronald, Wash.—Contract closed with McNally Pittsburg Mfg. Corp. for one McNally Tromp dense media reject washer for Roslyn-Cascade No. 4 mine to process 90 tph of 3x⅛ washer middlings from existing cleaning equipment. Dewatering and rescreening facilities for recovered washed coal. Plant complete with dense media circuit. Recovered coal returned to existing loading facilities. Completion November.

W. G. Duncan Coal Co., Greenville, Ky.—Contract closed with McNally Pittsburg Mfg. Corp. for 175 tph stoker coal crushing and rescreen facilities for Graham Mine. New facilities are in addition to present coal cleaning equipment. Centrifugal dryer also added. Completion early 1956.

Harold Fuel Co., Inc., Harold, Ky.—Contract closed with McNally Pittsburg Mfg. Corp. for McNally-Norton unit washer as an addition for processing 100 tph of 5x¼ raw coal. Recovered washed coal returned to existing facilities for final screening and loading. Completion, November 1955.

Panther Red Ash Coal Corp., Oakwood, Va.—Contract closed with McNally Pittsburg Mfg. Corp. for McNally-Norton automatic unit washer as an addition to existing facilities. To clean 100 tph 3½x⅛ raw coal. Washer complete with water clarification and recirculation system. Washed product to be returned to existing facilities for loading. Completion January, 1956.

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Charleston—Rish Equipment Company
Clarksburg—Rish Equipment Company
Fairmont—Fairmont Supply Company
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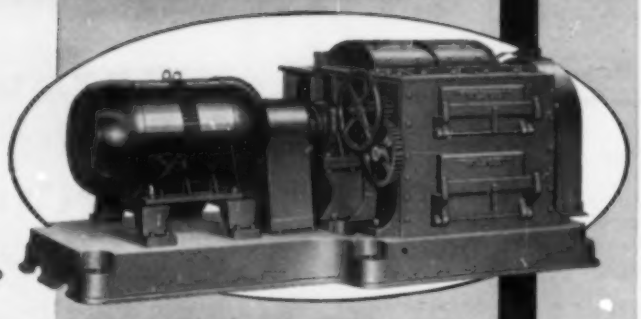
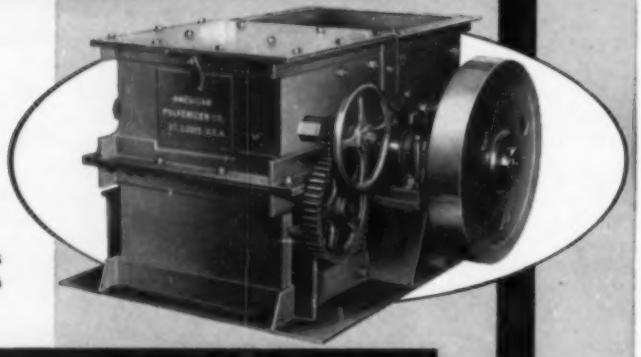


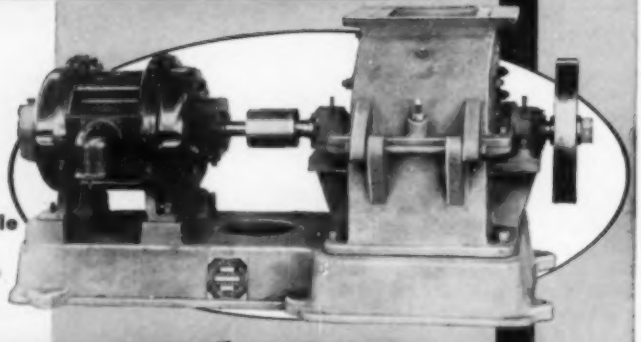
AC Series
capacities to
800 TPH

Reduction
Cost Per Ton . . .



WC Series
capacities to
90 TPH

the Best Answers*. . .



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Association Activities

Pritchard Heads Association

Thomas H. Pritchard, president of the Margaret Ann Coal Co., Conaway, Va., was elected president of the Operators' Association of the Williamson Field at the association's annual meeting in Williamson, W. Va. At the same time the association: (1) chose James S. Laird, vice president of the Gay Mining Co., Mt. Gay, W. Va., to fill the post of vice president; (2) chose Laurence E. Tierney Jr., president of Eastern Coal Corp., Bluefield, W. Va., to be treasurer; and (3) returned Joseph J. Ardigo to the post of executive secretary.

Return Newton to Kanawha Post

The Kanawha Coal Operators Association returned L. Newton Thomas to office as president during the association's annual meeting in Charleston, W. Va. Mr. Thomas is president of the Carbon Fuel Co., Charleston. The operators also returned James S. Conley, president of the Wyatt Coal Co., Charleston, to the association's vice presidency. C. C. Dickinson Jr., vice president of the Dickinson Fuel Co., Charleston, was elected treasurer and Harry G. Kennedy was re-elected executive secretary.

Parker Heads Alabama Institute

W. H. Parker has been re-elected president by members of the Alabama Mining Institute. H. F. DeBardeleben, chairman of DeBardeleben Coal Corp., and P. H. Neal, president of Alabama By-Products Corp., were elected vice presidents. H. P. Sibert was elected secretary-treasurer.

Operators Chose Caperton

S. Austin Caperton, president of the Slab Fork Coal Co., Slab Fork, W. Va., was re-elected president of the Winding Gulf Operators' Association at the association's annual meeting. J. A. Baritell, superintendent of Gulf Smokeless Coal Co., McAlpin mine, McAlpin, W. Va., was re-elected for a third term as vice president. P. C. Graney, president of Gulf Mine Co., was re-elected treasurer, and Hal M. Scott, elected secretary each year since 1939, was returned again to that office.

Trotter Coal Group President

James F. Trotter was elected president of the Northern West Virginia Coal Association at the organization's annual meeting. Three men, George R. Higinbotham, W. J. B. Mayo and Stephen Canonico, were elected to serve as vice presidents. T. E. Johnson was re-elected secretary-treasurer.

MEETINGS

Coal Mining Institute of America; 69th Annual Meeting, Dec. 15-16, Hotel William Penn, Pittsburgh, Pa.

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Slash Operating Costs . . .
Boost Production with
Lincoln LUBRICATION SYSTEMS

Whatever your lubricant application problem may be . . . automated production lines . . . a low cost automatic system for original equipment, or positive, reliable maintenance of existing facilities, Lincoln has the most modern device or complete system to meet your particular requirement.

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POWER-OPERATED DRUM PUMPS
(For Original 100 lb. or 400 lb. Drums)
Complete selection of Air-Motors and Pump Tubes.

GREASE GUNS (Heavy Duty Steel Construction)
Lube Capacities from 16 oz. to 32 oz.

GREASE FITTINGS
(All Types and Thread Sizes)
From Hydraulic Ball-In-Head to Self-Tapping.

PORTABLE POWER LUBRIGUNS
(Electric or Air Operated)
Lube Capacities from 30 lbs. to 60 lbs.

BUCKET PUMPS
(Portable-Steel Construction)
High and Low Pressure Models.

POWER-OPERATED TRANSFER PUMPS
(For Transferring Lubricants and Fluids From Original Drums)
Empties 55 gal. drum of S.A.E. 30 oil in two minutes.

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(For Grease, Oil, Air and Water Services)
Heavy Duty, spring actuated.

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Complete Combinations of Pumps and Hose Reels. Standard Groups or Custom-Built Rigs.

MATERIALS DISPENSING SYSTEMS
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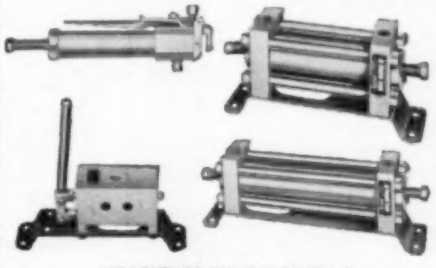
Complete Systems for Original 400 lb. Drums, or 5 gal. Packages.



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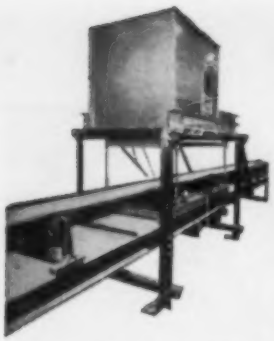

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The MERRICK WEIGHTOMETER gives the answer. While material is smoothly moving along a conveyor, the MERRICK WEIGHTOMETER not only keeps a continuous and accurate record of weights but total weight is available at a glance.

Applied to any size belt conveyor, either horizontal or inclined. The Weightometer gives a simplified and dependable record of your production, without interrupting flow of coal

Write for Bulletin 851

MERRICK SCALE MFG. CO.
Engineers and Mfrs. of Automatic Weighing Equipment
PASSAIC, N. J.

Among the Manufacturers

Joy Makes Executive Changes

William C. Russell was appointed general manager of the St. Louis Div., Joy Mfg. Co., Pittsburgh, Pa. He assumes responsibility for engineering, manufacturing and sales of products consisting primarily of fittings, connectors and electrical equipment for mining and general industries. Mr. Russell, before joining Joy, had been sales manager and chief engineer of Dodge & Seymour, New York, N. Y.

In other personnel moves Joy announced these changes at its Franklin, Pa., plant: Herman Van Houten, staff specialist and special representative for the Pittsburgh Executive Sales Dept., to sales manager of renewal parts; R. T. Hair, manager of service to manager of continuous miner and loader products; W. E. Overturf, manager of field service to service manager of mining products; Earl Bradley, special demonstrator of coal machines, to manager of shuttle-car products; W. Kenneth Baird, former chief industrial engineer, to manager of manufacturing.

J. W. Woolf to assistant chief engineer, administrative; C. W. Fitzgerald to assistant chief engineer of product design; Kenton McElhattan to product engineer of continuous miners; W. G. Young to assistant product engineer of continuous miners; C. F. Shultz to manager of industrial engineering.

GE Plans Gradual Plant Shift

General Electric's Industry Control Dept. disclosed that its manufacturing and office facilities gradually will be shifted from its Schenectady, N. Y., headquarters to Roanoke, Va., site of a new multimillion dollar plant. Pilot operations were expected to start this fall, B. W. Mahony, department general manager, said. General Electric estimated that the transfer of operations would be completed early in 1957. Construction of the new plant was expected to be completed in January, 1956. Some 1,800 persons will be employed in manufacturing large control devices and equipment for industry when the operations transfer has been completed.

W. R. Stamler Incorporates

W. R. Stamler Co., established in 1949 in Paris, Ky., has incorporated. Its new name is W. R. Stamler Corp. Labron W. Miller, general manager, said that "present business is at an all time peak and has necessitated the addition of new facilities to meet the increased demand for the corporation's products." Stamler specializes in hydraulic automatic car-spotting equipment. The corporation's officers are W. Ray Stamler, president; W. R. Stamler Jr., vice president; and Mr. Miller, general manager.

Templeton-Matthews Sales Agent

Heyl & Patterson, Inc., Pittsburgh, Pa., United States agents for the Reineveld fine coal dryer, has appointed Templeton-Matthews Corp., Terre Haute, Ind., its sales and service representative for Reineveld equipment in Indiana and Illinois.

Gardner, Syntron Sales Manager

Earl K. Gardner was appointed district manager of Syntron Pittsburgh Sales Co., South Charleston, W. Va. Mr. Gardner will handle the sales of laboratory equipment, power tools, shaft seals and heating elements in West Virginia and Virginia.

Smith Named Goodrich Manager

Wilfred A. Smith was named manager of new product sales by the B. F. Goodrich Co., Industrial Products Div., Akron, Ohio. Mr. Smith joined Goodrich in 1924 as a mail clerk. In 1950 he became manager of molded and extruded products.

Stocum On Vibrator Sales Staff

The Cleveland Vibrator Co., Cleveland, Ohio, has appointed Gilbert R. Stocum sales engineer of electric and pneumatic vibrating equipment. Mr. Stocum was district representative of the Syntron Co., northern Illinois and, later, production manager for Cenpro Corp.

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NEW Hendrick Wedge Wire
Now! With the addition of new Hendrick Wedge Wire, Hendrick rounds out its line of screens for the best in efficient, low-cost screening, de-watering and filtering operations. Hendrick Wedge Wire is ideal wherever it's important for screen openings to be minutely fine, have excellent draining qualities and a high degree of accuracy and rigidity. For details on Wedge Wires free clearance, rugged mechanical and lateral strength, maximum load carry capacity, percentage open area and long wearing life, call Hendrick, today!
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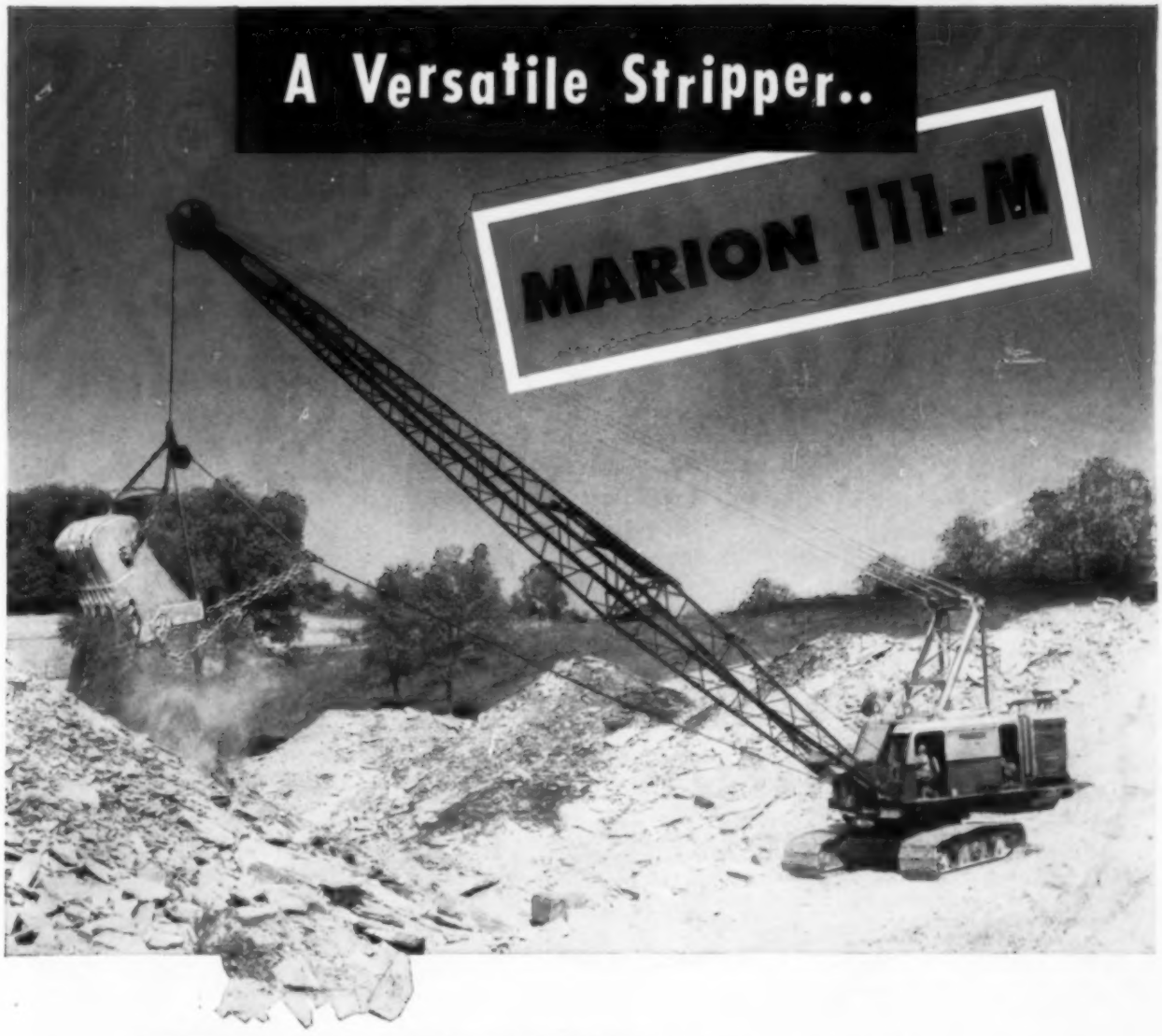

FIVE-YARD BITES Uncover 30-Inch Coal Vein in Ohio

This MARION 111-M dragline is stripping away 35 feet of gravel and rock to uncover a vein of coal ranging from 30 to 36 inches.

Its 5 cubic yard bites, with the help of the fast, cool swing of the 111-M, make steady progress. This 111-M is basically a diesel machine, but it has electric swing, which means speed and freedom from swing clutch problems.

Get more of the story about this strip mine and others in which MARION 111-M machines are playing an important part.

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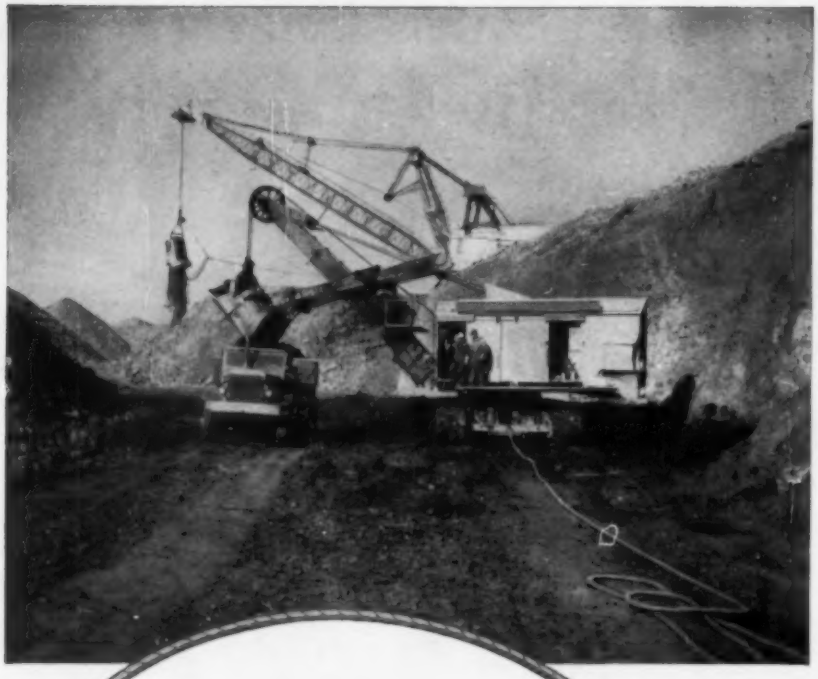

BREEDING GROUND FOR CABLE WEAR

Everywhere these shovels go, their power cables have to follow. There are enough jagged edges and abrasive surfaces in any open pit operation to quickly tear cable coverings to shreds. To cut down on upkeep, mine maintenance men everywhere are using Ruberoid Insulating Tape to protect all electric cables.

Ruberoid Insulating Tape is made of a tough fabric saturated with asphalt. Adhesive on both sides provides the strongest possible grip that won't tear or ravel. It's acid and alkali proof and extra thick so that one layer gives the maximum in protection and insulation.

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before joining Cleveland Vibrator. He will cover Illinois from the Chicago office.

Hunter Is Diesel Sales Manager

Robert E. Hunter was made general sales manager of the Detroit Diesel Engine Div., General Motors. Mr. Hunter had been director of sales in General Motors Diesel, Ltd., Canada. He joined General Motors in 1937 as business manager in the Pontiac Motor Div., later was transferred to the Electro-Motive Div. as assistant director of industrial relations.

Evans Taylor Gets Exide Post

Evans Taylor, former Philadelphia sales engineer of Exide Industrial Div., the Electric Storage Battery Co., has been made sales engineering manager. Mr. Taylor began working for Exide in 1936 as a laboratory assistant. In 1942 and 1943 he was a U. S. Army Air Force advisor on aircraft batteries. He specialized in railway and motive power battery sales from 1946 to 1951.

And For Your Information . . .

The Cauhorn Distributing Co., Detroit 19, Mich., has been appointed sales agent in the United States and Canada by the Perma Seal Roof Coating Co.

R. D. Greer, former assistant mine superintendent of Inland Steel Co., Wheelwright, Ky., has been employed by the Joy Mfg. Co., Franklin, Pa., as an application engineer in the Products Div.

REPORT EARNINGS

Island Creek Coal Co.—9 mo to Sept. 30, 1955, net income $3,851,951, equal to $1.97 per common share, against $1,448,601 and 70c in the same period of 1954.

West Kentucky Coal Co.—9 mo to Sept. 30, 1955, net income $406,184, equal to 47c per common share, against $466,487 and 54c in the same period of 1954.

Pittsburgh Consolidation Coal Co.—3rd quarter 1955, net income $2,809,409 equal to $1.30 per common share, against $2,498,706 or $1.16 in 2nd quarter of 1955. A total of $3.57 per share earned in the first nine months of 1955 compares with $3.26 earned in the same period of 1954.

West Virginia Coal & Coke Co.—9 mo to Sept. 30, 1955, net income $596,106 against net loss of $71,970 for the same period in 1954.

Truax-Traer Coal Co.—6 mo. to Oct. 31, 1955, net income $1,046,953, equal to 79c per common share, against $740,418 and 51c in the same period of 1954.

Glen Alden Corp.—9 mo to Sept. 30, 1955, net income $1,505,000 against $1,240,000 loss for the same period in 1954. Shares earned 88c this year against a loss of 73c last year.

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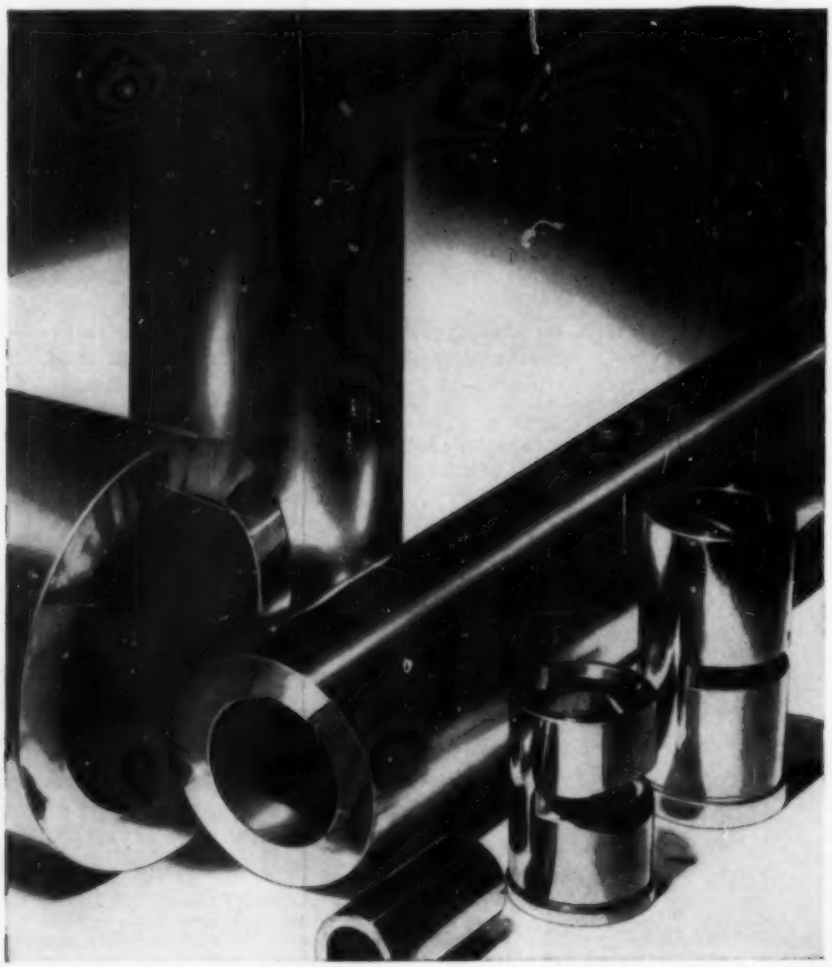

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Kentucky Meet (from p 96)

Sergent, William Donahue, Truman Conley, Edris Carter, French Mabe Jr., and F. L. Travis. The first-aid team, from Blue Diamond Coal Co., includes Walter Williams, captain; Harry Bevans Jr., Tyra Eldredge, Paul D. Napier, Quentin Napier and Jimmy Begley.

Speakers and their subjects at the opening session Thursday were as follows: Fred W. Gesling, engineer, Ashland, Ky., "Gas Lines Over Mineral Properties and Over Mining Operations"; Sid N. Gay, sales manager, Spencer Chemical Co., who read James A. Miner's paper on "The Akremite Blasting Process for Strip Mining"; L. H. Harrison, electrical engineer, USBM, Birmingham, Ala., "The Use of Alternating Current With Face Equipment"; and Theodore M. Barry, Theodore Barry & Associates, Los Angeles, "Work Measurement and Supervision Incentives for Mining."

GAS LINES OVER MINES

"Little thought has been given to the hazard that may occur from the laying of high-pressure gas transmission lines and lines carrying liquids, such as gasoline and oil, over workable mine areas," Mr. Gesling declared in opening the first session. Gas transmission companies until recently have not recognized mineral rights in buying right-of-way, but have only purchased easements from the owners.

The consideration that necessary lateral and subjacent support for pipelines be maintained is now part of right-of-way agreements, and whether or not specifically stated in the agreement, it is implied. This puts an extra burden on the coal operator to meet the conditions and mineral left in place will be lost. Mining and stripping projections will be affected by these special conditions and more layout problems will be created, Mr. Gesling said.

If there is the possibility of subsidence and ensuing breaks in pipelines, then there is the potential hazard of escaping gas or liquid entering the mine. The nature of the overburden should control the type of safety measures, but each case requires special study.

In strip mining, protecting pipelines is somewhat different than in underground mining. The right-of-way cannot be disturbed. Overburden and waste cannot be placed in it. The cost of crossing lines with heavy equipment is almost prohibitive. Special provisions must be made for any crossing and the gas company attempts to specify how and where these crossings shall be made, and provides for inspection and construction by them, Mr. Gesling added.

Leakage from pipelines may find its way underground through subsidence over old workings, abandoned gas or oil wells, unplugged core-drill holes; or fissures in the rock strata. Coal companies therefore are continually facing the possibility of gas entering the workings and causing an explosion or fire.

"I know of no practical mining ventilation precaution that could take care of gas entering mine workings under pressure. The quantity of air necessary to dilute gas at any one point would be so great that it would be impossible to make such an amount of air available in underground workings," Mr. Gesling emphasized.

Mining companies have a double responsibility when gas lines cross their properties. First, they must protect the rights of the gas companies by mining in such a manner to protect lines; and second, they must protect their employees and property from the possible hazard created by gas lines near their mining operations, Mr. Gesling said.

OVERBURDEN BLASTING

Mr. Miner's paper on the Akremite blasting process was the same as the one presented at the American Mining Congress in May. A summary of this paper appeared in the June issue of *Coal Age* (p 87). A complete description of Akremite also was published in the May issue of *Coal Age* (p 70).

ALTERNATING CURRENT AT THE FACE

"Recently, because of the problems involved in transmitting large amounts of power and the low voltages allowed at the working faces, there has been a trend toward the use of alternating current," declared L. H. Harrison. This applies especially to the newer mines where DC systems and equipment were not already available.

The mine operator facing the possibility of using AC in his mine should understand the essential differences in the operating characteristics of AC and DC motors. Probably the most important of these are the speed-torque characteristics.

Speed and torque values can be varied widely by varying the number of shunt and series-field windings in a DC compound motor. Such a motor has the ability to change speed to accommodate the applied load, and the torque will remain fairly constant. The AC-motor torque, both for running and starting, varies about as the square of the line voltage, the speed remains nearly constant. A DC motor usually is desirable for mine service because of its favorable speed-torque characteristics. But if an AC motor is large enough to provide the necessary torque for a job, its constant speed will do the work in less time. Today manufacturers design and build AC motors that develop high starting torques with low starting current, Mr. Harrison said.

Two general types of 3-phase AC power systems are (1) the ungrounded delta system, and (2) the Y-connected grounded-neutral system.

The ungrounded delta system usually originates in a bank of three single-phase transformers connected in delta. It normally is operated ungrounded and has some inherent advantages that make it popular where continuity of operation is important. For example, one transformer may be removed from a bank of three and operation continued as a normal 3-phase system at somewhat reduced capacity.

Disadvantages are principally those relating to safety, and are as follows:

1. Voltage from phase to ground or from equipment frames to ground may equal the phase-to-phase voltage of the system under fault conditions.

2. Increased voltage stresses are impressed on insulations under insulation fault conditions, increasing the possibility of further breakdown of the insulation.

3. It is almost impossible to provide effective ground-fault protection on such a system without adding special equipment.

4. Simultaneous ground faults may exist at remote points in the system without opening the devices, thus setting up ignition and fire hazards resulting from stray currents in the rock strata.

The modern trend in AC practice is toward the Y-connected system, with the neutral grounded and the grounding conductor carried along with the phase conductors. Such a system provides certain operating advantages as well as better protection for men and machines.

Better protection can be obtained against lightning surges because the system is solidly grounded and numerous paths to ground are provided through the transformers and the single-phase loads. The grounded neutral permits the ground-fault protective devices to function dependably. Furthermore, the phase-to-ground voltage is limited, and can never equal the phasse-to-phase voltage as long as the neutral is properly grounded, Mr. Harrison added.

The most important advantage in using AC current is the saving that can be effected in transmitting power and the ease with which it may be transformed near the working faces. Considerable saving in copper can be made by transmitting power at 2,300 or 4,160 v and transforming it to lower voltages near the working faces.

Good power factor is desirable to keep transmission losses at a minimum. The most suitable method of power-factor correction for mine installations is by means of shunt capacitors. The use of shunt capacitor banks on mine feeder circuits may present a serious shock hazard, unless proper provision is made for isolating the capacitors when the line is deenergized, Mr. Harrison warned.

"Our experience with AC equipment to date at Enoco mine has been very satisfactory," said John A. Stachura, in discussing AC power in continuous mining. A thorough study was made to compare AC and DC power on the following points: (1) initial cost; (2) cable cost and ease of handling; (3) efficientcy; and (4) protection from electrical hazards.

Results of the study show that the initial cost of AC equipment was considerably lower than DC equipment. Electrical equipment on an AC Colmol was 9.8% less than on a DC machine; the 300-kva transformer was 69% less than a 300-kw rectifier. Cable cost was cut more than 50% and cables are easier to handle.

The problem of training maintenance men is greatly simplified. Simplicity of construction made training and maintenance easier.

Primary energy is brought into the mine at 2,400 v through a drillhole near

the working section. Both steel-armored lead-sheathed and neoprene type G shielded cable have been used for transmission lines. The neoprene type G cable has proved far more satisfactory for high-voltage transmission underground.

In brief, the system includes cable sectionalizing with oil disconnect switches with series-trip coils; a 300-kva dry-type transformer; 250 M cir-mil PCG secondary transmission cable in 150-ft sections; permissible junction boxes; and 2/0 sectionalized trailing cables with permissible connectors.

"Because of the portability of the conversion equipment and the ease with which sections of cable can be added or taken out of the system, we have always had good face voltage," Mr. Stachura said.

Electrical repairs on the three Colmols to date were as follows: one 600-amp circuit breaker replaced when a terminal was destroyed as a result of a faulty connection on the trailing cable. A set of contactors, replaced after 1 yr of operation, were found to be in good condition. The only motor trouble resulted from a defective fan causing a ground fault between rotor and stator windings. Motor inspections are eliminated and the only electrical preventive maintenance required is periodic inspection of the controllers, Mr. Stachura concluded.

The principal objection to AC equipment is trouble resulting from low voltage, said Frank J. Forsyth, electrical engineer, Kentucky Department of Mines, Pikeville. Therefore, frequent moves are needed and equipment must be portable. Sluggish operation may be another objection but this stems from low voltage. The higher AC face voltage probably is less hazardous than it appears since the wires are all insulated and enclosed. If one bare wire should be touched, the hazard would be within the same range or less than if touching a bare trolley wire.

STANDARDS AND INCENTIVES

"There is a new look in the coal industry today and it already is showing signs of being a big thing," said T. M. Barry in describing work measurements and supervision incentives for mining. Companies using engineering cost standards have increased significantly today and 25 have adopted them in the past several years.

Good management doesn't simply happen. Controlling costs is one of management's biggest problems. If you know what costs should be then something can be done about reducing them to that value. If there are no work standards there is a 10 to 15% loss in productivity. An analysis of 50 mines showed that from 55 to 80% of what could be done was actually done, Mr. Barry declared.

Work standards and incentives can help the operator in the following ways: (1) Help determine what equipment is best; (2) make it possible to balance the work cycle; (3) measure performance; (4) improve scheduling, estimating, equipment moves and spot poor methods, Mr. Barry said.

Without standards or incentives, production will be about 60% of what it should be. With them it will be 115% of standard values. If supervision incentives can be made compatible with company policy, they will be worthwhile, Mr. Barry concluded.

Major subjects at the Friday morning session were "Safe Controls for Belt Lines," by E. T. Moroni, general superintendent, Bell & Zoller Coal Co., Madisonville, Ky., which was read by Guy Browning, Robinson & Robinson, Charleston, W. Va.; "Mobile Belt Conveyors," by William Hanson, Joy Mfg. Co., New Philadelphia, Ohio; "Rock Dusting and Sampling," by Dr. Irvin Hartmann, physicist, USBM, Pittsburgh, Pa., and James Westfield, assistant director, Health and Safety, USBM, Washington; and "Wet Rock Dusting in the Mining Cycle," by Wayne Snell, U. S. Steel Corp., Pittsburgh, Pa.

BELT CONTROLS

Safe controls for belt lines should be analyzed from two viewpoints: safety in operation and safety to personnel who come in contact or use the devices for controlling the belt.

There are many standard switches, relay and devices for controlling belts along with a variety of company-designed controls that are satisfactory for automatic belt control. However, the increasing use of belts to transport men and supplies as well as coal has resulted in the development of several types of manual controls, Mr. Browning said.

One of the first units included paralleling the belt with an electrical circuit having the same voltage as the belt controller and including suitable interrupting devices that could be operated manually to stop or start the belt. This high-voltage circuit could seriously shock a worker who might come in contact with faulted sections of it, or falls of roof could cause a serious ground fault and result in a mine fire. It therefore is unsafe, Mr. Browning said.

A low-voltage control is used at Bell & Zoller's Oriole mine to control belts manually. Designed by Jimmy Hale, Miners Coal Co., Fies, Ky., the system included a 300-v DC circuit in which two 50-w lights connected in parallel are series connected with an adjustable resistor to provide a 6-v pilot circuit that operates a simple relay. A two-conductor stranded telephone wire suspended on nail-type porcelain insulators serves as the pilot line, Mr. Browning added.

At 300-ft intervals, all shuttle-car discharge points and belt-discharge points simple enclosed toggle switches are installed to permit interruption of the low-voltage pilot circuit.

The 6-v relay energized by the pilot circuit closes a circuit to the starter relay of the belt. When the pilot circuit is broken, the starter-relay circuit is opened. The starter relay operates at the same voltage as the belt controller and has two 50-w 300-v lights in parallel in the circuit. This low-voltage circuit is safe and provides complete lock-out from any of the toggle switches along the belt. The disadvantage is that an employee must first reach one of the control stations before the belt can be stopped, Mr. Browning observed.

Another type of control employs three different relays and must be used in connection with a magnetic starter. Two dry-cell batteries provide 1½ v for two bare wires suspended over the belt or parallel with it. If the two bare wires are touched together, the belt stops. Both wires must be released for a short interval and then touched together again to restart the belt. The belt remains locked out as long as contact is maintained between the two bare wires, Mr. Browning explained.

The pilot line is effective for belts up to 2,400 ft long. In any emergency the belt can be stopped instantly from any location along the conveyor and can be locked out. One disadvantage is the unnecessary stopping and starting of the belt for other than emergencies, Mr. Browning concluded.

A summary of Mr. Polack's paper on fire resistant belts appears in the *Coal Age* report of the National Safety Council meeting (p 85) where the author first presented the paper.

MOBILE BELTS

"I am firmly convinced that we have been underrating the importance of the extensible belt not so much as a new piece of equipment designed for a specific job, but rather as a forerunner for a completely new line of conveyors which will play a vital roll in the reduction of the cost of producing coal," said William Hanson in discussing mobile belt conveyors. Much attention has been given to the development of high speed mining machines, but little thought was given to the haulage equipment to go with it. Aside from bringing about a new method of mining, the continuous miner accented the need for continuous haulage and forced development of mobile conveyors.

The key to continuous haulage was development of a belt conveyor that could be extended while transporting material. The Joy extensible belt conveyor is the first practical answer to this need, Mr. Hanson said.

Extensible belts are ideal for long rooms. The longer the rooms, the more economical the system becomes because development cost is reduced. Fewer entries are needed for a given area of coal; consequently, fewer track or entry belt installations are needed. Shuttle car hauls in long rooms are short, thus loading or mining equipment is kept busy.

Belt extensions can be made while they are operating so that no time is lost and no between-shift or overtime labor is needed. Citing several examples of how an extensible belt can be used advantageously, Mr. Hanson said the potential for this type of equipment is as bright as any in the field and that we are entering the age of continuous haulage.

ROCKDUSTING AND SAMPLING

"To be effective, rock dust must be applied uniformly and continuously on the rib and roof surfaces, as well as on the floor of entries. The rate of application must be adequate to raise the in-

combustible content of the mine dust to a minimum of 65%," Dr. Hartmann said. Experiments show that coal-dust explosions can be stopped most successfully near their point of origin. Since most ignition sources are near active faces, rock dusting must be carried as close to the face as possible, in any case at least to within 40 ft.

Dr. Hartmann listed and explained the following erroneous ideas on how rock dust works and the development of explosions. In brief, they are:

1. Dormant rock dust is thought to prevent ignition of pure coal-dust clouds. Actually, rock dust has no effect until it is thrown into suspension.

2. Rock dusting along entries need not be continuous and uniform; deficiency of incombustile in one place can be offset by excessive rock dust elsewhere; and the incombustible contents of samples from several locations can be averaged to determine compliance with the 65% limit. Actually, since a dust explosion is progressive and dynamic, there can be no compensating for rock dust deficiency. When an explosion reaches an area that lacks incombustile dust it is intensified.

3. Abundant "blanket" application on the floor is believed capable of compensating for partial rock dusting on the ribs and roof. At other mines, rock dust on the rib and roof is thought sufficient. Experiments show that whereas under certain conditions a small deficiency of rock dust on the floor can be offset by excess rock dust on ribs and roof, the reverse is not possible.

4. Rock dusting is thought to be important only in the vicinity of the active working faces. This is wrong. A number of ignitions started in entries far from the face and because of insufficient rock dusting, some developed into widespread explosions.

5. Rock dusting is believed needed only in dry areas, because in damp and wet sections the coal dust is harmless and rock dust cakes and loses its effectiveness. Some mine areas become alternately damp and dry many times a year. It would be wrong to leave them without rock dusting.

6. It is thought that an explosion originating in a short, non-dusted area can be stopped instantly or within a very short distance after it reaches a rock-dusted section of an entry. Actually, such explosions will propagate 100 to several hundred feet in the rock-dusted zone before the flame is completely extinguished.

7. It is believed that rock dust need not always be applied to within 40 ft of the faces in rapidly advancing entries, but that application once daily is enough, leaving at times up to 300 ft of entry unprotected. Experiments indicate that explosions permitted to develop for such distances before entering rock-dusted zones might become more violent and propagate for 1,000 ft or more.

8. "Dustless" zones are thought to be effective in stopping explosions. No part of an entry in an operating mine can be maintained free of dust. Strong explosions can readily propagate through several hundred feet of nearly dust-free entries.

9. When mine dust contains 65% incombustible, it is believed that this provides a considerable factor of safety against explosions. This is not so. It is a fact that proper application and maintenance of ruck dusting to 65% will prevent nearly all widespread explosions.

10. Ordinary stoppings are thought to be effective in preventing propagation of explosions. Actually, most stopping will not withstand high pressures and are easily destroyed by weak explosions.

11. A few water sprays used at the face during cutting and loading are believed capable of allaying nearly all fine coal dust at the source so that no float dust is carried by the air current, and therefore re-rock dusting is not needed. It is true that sprays do much good, but they are effective against large quantities of the finest dust.

12. All inert materials in mine dust are believed to be as effective as limestone. Actually, sand, shale and others often found in mine dusts are not as effective against explosions as limestone.

When difficulty is met in getting good adherence of rock dust on ribs and roof, slight moistening of these surfaces shortly before or simultaneously with rock dusting should be tried, Dr. Hartmann said.

Results of studies of wet rock dusting showed that:

1. Dry rock dusting was more effective than wet rock dust in arresting the propagation of an explosion.

2. Wet rock dust was somewhat more effective after complete drying.

3. Dry rock dust distributed on the floor where wet dust was applied on ribs and roof helps greatly in limiting explosion propagation.

4. Explosions were readily stopped when the rock dusted zone started 50 ft from the face, except when finely pulverized coal dust was applied over the wet rock dust.

5. When rock dusting started within 100 ft of the face, it was hard to stop some explosions. When it started 150 to 200 ft from the face, it was very difficult, if not impossible to stop them. Dr. Hartmann warned.

The final session Friday afternoon was devoted to a discussion of the coal mine safety act by E. R. Price, Federal Coal Mine Safety Board of Review, Washington, D. C., and a report on fires and gas ignitions in Kentucky during 1955 by A. D. Sisk, chief, Kentucky Department of Mines, Lexington, Ky.

THE SAFETY ACT

The first Federal coal-mine safety code for bituminous coal and lignite mines was adopted and issued pursuant to section 2 (a) of the Krug-Lewis agreement on May 29, 1946. Later, this code was incorporated in the National Bituminous Coal Wage Agreement and compliance with its provisions became a contractual obligation, Mr. Price said.

A series of disasters between 1947 and 1952 resulted in passage of Public Law 552, known as the Federal Coal Mine Safety Act, which became law on July 16, 1952. Briefly, Public Law 552 incorporates Public Law 49, passed in 1941, as Title I and adds a new part designated as Title II. Under Title I, the Bureau of Mines retains its former duties of making inspections of recommendations. Any appeal by an operator from a finding and recommendation of a Federal inspector under Title I must be made to the Joint Industry Safety Committee established by the Coal Wage Agreement.

Title II is headed: Prevention of Major Disasters in Coal Mines. The act was intended to write into law safety standards which would, if followed, prevent major disasters in the coal mines of this country. During the 3-yr period immediately prior to passage of the act, seven major disasters occurred, resulting in the death of 168 men. During the 3-yr period immediately following passage of the act, there were two major disasters in which 21 men were killed. This is a 71.4% reduction in the number of disasters and an 87.5% slash in the number of men killed, Mr. Price emphasized.

Title II also created the Federal Coal Mine Safety Board of Review, whose function is to hear and determine appeals by mine operators from orders issued by federal inspectors or the Bureau of Mines. The law provides that orders issued by the Board shall be subject to judicial review by the United States court of appeals for the circuit in which the mine affected is located, and that the decision of the court of appeals may be subject to review by the United States Supreme Court.

It has consistently been the policy of the Board to keep its rules of procedure at a minimum and state them in simple language, as well as conduct its proceedings in the simplest manner consistent with good practice. At any hearing, the burden of proof is placed by law upon the Bureau of Mines to show the existence of the imminent danger, the violation of section 209 or the presence of methane sufficient to support a gassy classification order. The law specifically provides that the Board shall not be bound by any previous findings of fact by the Bureau or by any representative of the Bureau. Therefore, each party has a completely fair opportunity to present his evidence to the Board, Mr. Price emphasized.

In a summary of the mine fires and gas ignitions in Kentucky for the year elapsed since the last Institute meeting, Mr. Sisk said there were 18 fires and three gas ignitions. Ten of the fires were underground, including six electrical, two belt and two outcrop fires. Of the outside fires, three were of unknown origin. One of the underground gas ignitions was caused by a defective shooting cable that had been connected to a 275-v power source. Another underground ignition was caused by a worker attempting to light a cigarette with a lighter. A line curtain placed to direct air to a previously cleared face had been removed by a loading machine crew and not replaced. Gas accumulated and was ignited when the worker attempted to light the cigarette. The third gas ignition took place on the surface when acetylene leaking from an undetected defective tank valve accumulated at the roof of the shop and was ignited by a torch.

AIME-ASME (from p 91)

Oil imports will possibly reach a peak of 2.3 million bbl per day, remain there a while and then decline. Imports above this do not seem reasonable because of the shipping needs, world-wide increase in demand for petroleum, and national security. Before the time of maximum imports, production from shale should be ready to take up some of the slack. Shortly thereafter production of synthetic fuels from coal should be started. It appears necessary to be prepared to have synthetic plants ready sometime before 1970, when a large deficit is evident. Ultimate reserves of petroleum in this country may be found to be greater than estimated, but the need for large quantities of synthetic liquid fuels would be delayed only for a few years, Mr. Batchelder said.

Projected production of natural gas for 1975 is estimated at 17.3 trillion cu ft. By that time natural gas reserves may be only ten times the annual consumption. And before then, either the use of natural gas must be curtailed or supplementary gas must be supplied by synthesis from coal, Mr. Batchelder observed.

Forecasts indicate that production of synthetic oil might be 0.7 million bbl per day by 1965, 2.8 million bbl per day by 1970 and 6.1 million bbl per day by 1975. This forecast is based on continuing our standard of living and economic activity, Mr. Batchelder said.

Oil shales are an attractive source of oils and some production can be expected from them. The major deposits of shales lie far from most of the markets and, in the long run, it may be used locally. If one-third of the projected synthetic oil needs are met from oil shales, that will leave oil from coal needs at 0.4 million bbl per day in 1965 and 4.1 million bbl per day in 1975.

To meet the 1965 demand it will be necessary to invest over 4 billion 1952 dollars; use 2.5 million tons of steel in plant construction; mine 200,000 tpd of coal; and employ 750,000 people.

To meet the 1975 demand the requirements will be: an investment of 37 billion 1952 dollars; 22 million tons of steel for plant construction; an additional 1.9 million tpd of coal; and about 8,000,000 new employees.

Future natural gas needs are harder to predict. Consumption is limited by and follows closely the construction of transmission lines. Under present economic conditions, building a long line for less than 300 to 500 million cu ft per day is not generally attractive. Under present regulations regarding reserves, each new long line must have reserves better than 2 trillion cu ft. It is possible that long before the relation of reserves to annual consumption has dropped to an alarming figure, it would be more economical for a new line to be based partly on natural-gas reserves and partly on synthetic.

If 5% of the marketed gas production is synthetic, this would be about 2 billion cu ft per day, or perhaps 20 synthesis plants. These would cost $100 million each or a total of $2 billion. They would use 100,000 tpd of coal, Mr. Batchelder said.

DUAL-FUEL FIRING

In the spring of 1948 a study of Navy facilities for generating heat and steam showed a lack of standardization in general arrangement, design, maintenance and operating procedures, and inadequate metering and control equipment. The need for dual-fuel firing was pointed up by a coal strike that exhausted the coal supply at the Naval shipyard at Philadelphia. Fuel needs were met with No. 2 furnace oil and a pattern was established that essential Navy plants should, wherever practical, and for security reasons, be equipped for continuous and economical operation on more than one fuel, Mr. Deming reported.

The Bureau next began to standardize. Specifications for factory-fabricated packaged water-tube oil- and gas-fired boilers were developed. Results were excellent and installed costs dropped. The competitive position of coal was adversely affected, and therefore attention was focused on the coal-burning plant. A study of coal-fired plants was made and a saving of 3 to 5% of the coal bill was made when recommendations were put in effect, Mr. Deming said.

To improve standardization and reduce initial investment and operating costs, standard arrangement plans and specifications were made to govern future plant designs.

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LOOK AT THESE FIGURES

65% of 6 year sales are REPEAT
Car Spotter orders!

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Repeat business tells the story of STAMLER success! A mining company will buy a STAMLER unit and put it to work. In a few months they buy another one. It happens all the time . . . one piece of STAMLER Equipment sells another one and sometimes *many* more! *One company has 26 STAMLER Car Spotters!* Doesn't this make you curious as to what economies STAMLER could effect for you? Get the STAMLER story and get started on more efficient, more profitable mining.

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INCREASES TONNAGE LOADING POINT REDUCES COSTS
EQUIPMENT

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SCHROEDER BROS., Exclusive Eastern Sales Agent, PITTSBURGH, PA.
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"You've got to **roll it out** for **easy loading**"

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NON-EXPLOSIVE MINING METHOD

Cuts Costs 5 Ways

- Produces less fines in face preparation
- Rolls coal forward for faster, easier loading.
- Easier on "tender" roofs—cuts shoring, bolting
- Lowers cleaning costs by minimizing fines
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And that's just what the gentle, heaving action of Airdox does. Coal is dislodged from the working face and *pushed forward* in a loose, easy-to-handle pile. There's no digging to do. This means faster loading and less wear and maintenance on mechanical equipment. Add to these advantages a drastic reduction of fines at the working face and it's easy to see why Airdox is the most economical means known for face preparation.

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Phone: Ottumwa
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W. Va. Meet *(Continued from p 95)*

FUEL COMPETITION

Some factors in the present competitive picture were analyzed by Walter H. Voskuil, mineral economist, Illinois State Geological Survey, as a part of the institute's program on coal markets today and in the future. Noting that coal was the second cheapest fuel for industry in 1947, with natural gas first, Mr. Voskuil pointed out that in industries where fuel cost is a small proportion of the total, this situation tends to favor higher-priced competitive fuels. Where the percentage is high, purchasers tend to look for the lowest-cost fuel, and this favors coal which, however, must not let up on its efforts to keep its cost down.

In the electric-utility industry, natural gas has come in and oil use is declining, while coal is holding its own. A major reason for the use of gas is the interruptible contract. On the question of availability of interruptible supply, Mr. Voskuil noted until underground storage is available with sufficient capacity, such supply will continue. More storage should result in a shift from industrial use to domestic and firmer overall gas prices.

As for nuclear power, Mr. Voskuil made the point that only 10% of our energy use is electrical and electrical is all that the atom can provide. But even if used extensively, this would involve other operations and materials processing, and consequently would require more of the other fuels for this purpose. The overseas market, subject only to oil gains, said Mr. Voskuil, will be permanent since Europe cannot expand its coal production, and the only place coal is available is from the United States. Producers can help by striving to keep mine costs down and by using their efforts to reduce transportation and other costs as well.

FIRE-RESISTANT BELTING

Fire resistance in conveyor belting, said J. L. Thornton, manager, coal division, Belting Sales, Goodyear Tire & Rubber Co., is especially important to West Virginia, which has nearly 300 mi of belt underground, or 45% of the total underground in the United States. Kentucky is second with 20%; Illinois third with 14%. However, agitation for fire resistance first gained momentum in 1948 and 1950 in Great Britain as a result of numerous fires and considerable loss of life. Great Britain consequently turned to PVC, while efforts in the United States were concentrated on enhancing the natural resistance to fire of neoprene, which is substantially cheaper than PVC though approximately 17% higher than the No. 2 belting commonly used underground in the United States.

The Rubber Manufacturers' Association began work on the question of fire-resisting compounds and standards some years ago, and had nearly reached the stage of publishing findings, recommendations and standards when the U. S. Bureau of Mines embarked on its present program. However, said Mr. Thornton, "there is no such thing as a fireproof belt." And there are yet no fire-resistant belts meeting Bureau of Mines standards, simply because none have been tested.

Belt fires are of three types: (1) occurring within the belt or resulting from friction ignition, (2) fires in other parts of the conveyor, and (3) fires from outside sources. The latter is the most common. Good housekeeping is the answer, and if it prevailed generally there would be less need for fire-resistant belts.

MINER DEVELOPMENT

How redesign of the BCR machine to develop the Cleveland Hydra-Miner was handled was briefed by Spencer Bowman, manager, research department, Cleveland Rock Drill Div., Westinghouse Air Brake Co. The goal was 3,000 hr of operation without overhaul—a goal which few machines, regardless of type or industry, have achieved. Detailing how the development organization was evolved and how it operated, Mr. Bowman discussed the 17 objectives originally set up for the design program. Sixteen, he noted, have been attained, and the organization is close to attaining the seventeenth: a satisfactory floor cleanup. The first machine has logged 500 hr in two mines and has performed in accordance with expectations. The ultimate goal with this unit is 2,000 hr. On the maintenance angle, Mr. Bowman noted that it should be simpler and should make possible 3,000 hr before overhaul because of the way the machine was stress analyzed completely in design and the fact that it has only 8,000 total pieces, compared to 56,000 for the average automobile.

SAVING WITH THE ALTIMETER

Even a small mine will spend $4,000 to $5,000 a year for ventilation power. Consequently, observed Thomas Howard, The New River Co., Mt. Hope, W. Va., in describing "The Use of the Altimeter in Economic Ventilation," "such expenditures deserve more attention than they usually get, since many of these dollars are spent needlessly and large savings are often possible if the problem is given proper study."

Among the fundamentals that must be kept in mind in attaining economical ventilation is the fact that air moves from a high-pressure to a low-pressure area.

Since fan horsepower reflects pressure developed to move the air, and also the quantity, one method of attaining economy is keep the quantity within a safe minimum, since the smaller the quantity the less the horsepower. "To accomplish this, each section must be carefully regulated so that just the correct amount of air is circulated. The fan's blade position and speed must be kept in the proper range to supply just the right volume at a higher efficiency factor. Good permanent stoppings between main intake and return are also necessary to keep air leakage to a minimum."

But laws and regulations require a certain minimum quantity, and to make further reductions in horsepower it is necessary to reduce the pressure required to move the air. Since the total pressure is the sum of pressure drops in the entire circuit, reducing this total requires reducing one or more of individual drops which make up the total. An excellent means of determining these drops accurately and quickly is the altimeter.

A complete survey is nothing more than a series of readings from the portal to the fan showing elevation differences which then are converted to pressure losses in inches of water. The readings may be taken at regular intervals at strategic points, such as, split points, overcasts or a combination of both. Generally the quantity of air is determined at each location so that cost figures may be computed. When the computations are completed, exact data on pressure drops in each section of the circuit are available, and it is a simple operation to carry the computation on to arrive at an actual money cost for moving the air through each section. The bad spots stand out like sore thumbs when this is done.

Pressure-loss data are useful in a number of ways, Mr. Howard noted:

1. If the goal is reducing fan horsepower all the information is available for an intelligent approach.

2. If advance work is being projected, pressure-loss data on existing airways permit designing the new ones with definite knowledge of what ventilating cost will be.

3. If more air is needed, an altimeter survey shows where airways need attention to permit it to be moved without unduly increasing cost. If a blockage exists adding $100 per month to ventilating cost, doubling the quantity without removing the blockage causes the extra cost to jump to $800.

4. If a general study is considered desirable as a prelude to improvements, a 300-ft-per-in mine map showing cumulative pressure drops along all airways will quickly show what is possible in overcasting or in new airway projects.

1955 Coal Age Index In This Issue

Beginning on p 175, at the back of this issue, you will find a full index of the editorial material published in the January-through-December, 1955, issues and in the *Coal Age* Mining Guidebook, published in September.

This annual index is an editorial service designed to make it easier for you to locate pertinent references in your file of back issues. Articles are indexed in several ways to make it possible for you to find what you want, even though you may have forgotten the title of the story. If you know the name of the company about which the story is written, you may consult the Company Index, which lists all articles from each of the companies appearing in our 1955 issues. Or, if you know the author's name, your best bet is to turn directly to the Authors Index, where you will find the title under the author's name.

Be sure to place this issue in your files.

Wire Rope at Work — Large tonnages of coking coal are produced at this Southern mine, where an efficient twin-slope haulage system is used. From the mine proper, trains of heavily loaded cars are pulled up the slope to the tipple, there to be emptied and returned for more coal.

That big wire rope that seems to be zooming right out of the picture is one of the major haulage lines. Nearly two miles in length, it is a Bethlehem 1-in. Purple Strand rope, 6x19 Seale, with regular lay and fiber core. Long prior to the photograph it had built a reputation as a workhorse, with a haulage record of 1,000,000 tons in prospect. A very tough rope, the kind that really thrives on work, as the figures themselves attest.

Bethlehem Steel Company, Bethlehem, Pa. On the Pacific Coast Bethlehem products are sold by Bethlehem Pacific Coast Steel Corporation. *Export Distributor:* Bethlehem Steel Export Corporation

Mill depots and distributors from coast to coast stock Bethlehem rope for the following industries and numerous others:

MINING • CONSTRUCTION • PETROLEUM • EXCAVATING • QUARRYING • LOGGING • MANUFACTURING

Safety Congress (*from p 87*)

certified devices will be accepted in lieu of a grounding conductor in the trailing cable on off-track equipment. It is hoped this change in the schedule will encourage the development of new and better ground-fault protection.

Other changes permit the use of "Miller" plugs outby the last open crosscut, and the assembly of permissible parts into a permissible machine by the operator, subject to final inspection by the bureau. Qualified bureau personnel also may inspect and approve for permissibility any design changes made by machine owners which measure up to the bureau's standards.

To clarify the situation in rebuilding and overhauling, a provision has been added whereby a qualified builder or assembler may obtain permission to attach a plate on nonpermissible equipment that has been changed to permissible or on permissible equipment that has been repaired and restored in accordance with provisions of the new schedule.

Streamlined provisions for the experimental use of a machine in a gassy mine have been set up, Mr. Harrison concluded.

Presiding officer at the Wednesday session was **F. J. Foresman,** incoming chairman of the Coal Mining Sec. Speakers were **J. D. Reilly,** vice president, Hanna Coal Co., Div. Pittsburgh Consolidation Coal Co., St. Clairsville, Ohio, describing a new method of shaft sinking; **S. P. Polack,** health and safety engineer, USBM, Pittsburgh, on the proposed schedule for testing conveyor belting for fire resistance; and **L. W. Scott,** electrical engineer, General Electric Co., Charleston, W. Va., on protection of mine electrical circuits to prevent mine fires.

SAFE, ECONOMICAL SHAFT SINKING WITH BIG DRILL

A 79-ft-deep airshaft at Hanna's Glen Castle mine was sunk at lower cost and in greater safety by outlining the perimeter of the shaft with large-diameter drill holes on close centers, Mr. Reilly explained, in pointing out that the drill holes provided relief for the blasting and preserved the shaft walls from shock.

The perimeter of the circular shaft, which is 18 ft in diameter, was drilled on 1½-ft centers by a Joy Champion overburden drill down to a limestone strata to provide a bench for the shaft lining. An inner ring of holes, 1 ft inside the previously mentioned ring, was drilled down to the coal. This inner ring served as a cushion against which the solid core of rock could be blasted.

After a short breaking-in period, the rock was removed at a rate of 9½ ft per shift by a clamshell. The work was done without having men in the shaft, except for loading the last bucket in each round with material the clamshell could not pick up. A complete account of Hanna experience on this job, including hints for making the next one even better, appeared in *Coal Age*, April, 1955, pp 74-75.

FIRE-RESISTANT BELTING

A proposed schedule of requirements and tests leading to Bureau of Mines acceptance and listing of conveyor belts as fire resistant, Mr. Polack said, in explaining that to merit acceptance a sample of belting, submitted by the manufacturer, must pass both a flame test and a drum-friction test. In the flame test, the sample is exposed to a Bunsen-burner flame at 1,350 deg F, plus or minus 50 deg, for 1 min in still air. Then the flame is removed and the sample is subjected to a stream of air at a velocity of 300 fpm. The duration of flame is timed. An acceptable sample is one that does not flame longer than 1 min after removal of the Bunsen flame nor glow longer than 3 min.

The drum-friction test is applied only to samples which have passed the flame test. This involves turning a pulley under the sample for 120 min while weights are progressively added to the sample. A specimen that is destroyed during the test without sign of flame or afterglow or that does not develop a temperature of 482 F, is considered fire-resistant. A specimen does not pass if flame appears on the belt at any time during the test or if afterglow bursts into flame within 3 min after the test or continues to glow beyond this time, Mr. Polack said.

When a manufacturer's belt is accepted and approved, he may mark his belt as "fire resistant."

PROTECTING MINE CIRCUITS

"The hazard of mine fires due to faulty electrical circuits in mines can be rendered almost negligible by proper design of the circuits, proper setting of protective devices and the selection of proper equipment," Mr. Scott declared.

Some mine fires are set by the excessively high overload trip settings of DC circuit breakers. Such breakers should be set to trip at a current value 15 to 20% lower than the short-circuit current for the most remote part of the circuit, Mr. Scott said. And in many cases, where there is no breaker between the one in the substation and the most remote part of the circuit, it may be found that the necessary overload setting to trip the breaker on a short circuit may be below the overload rating or even the normal rating of the machine. In that event, a sectionalizing breaker should be installed in the circuit at a point where the load is low enough that the required safe setting of the breaker will not interfere with normal operation.

Other potential causes of fire in DC circuits are broken bonds which may arc in coal dust, trolley wires in contact with wet coal surfaces which may heat the coal to the point of combustion, unprotected pump motors which may overheat and uninterrupted power supply to unused or unpatrolled sections.

In AC systems, particular hazards are overloads which raise temperatures beyond the protective range of system insulation and faults which permit the impedance of the load to be bypassed. Correctives include proper design of circuits and intelligent selection of equipment and insulation, Mr. Scott concluded.

Illinois Institute (*from p 93*)

ANOTHER BOOST IN STRIPPING RATIO

The new Hanna Coal Co. shovel, a 60-yd giant with a 50-sec cycle now being erected at the company's Ohio operations, would not recover its $3 million cost merely on its ability to move more dirt, Mr. Reilly said, in explaining that the prime purpose of the new shovel is to open up a 30-million-ton reserve under thicker cover. This reserve is available to existing power lines, washing facilities, haulage roads and so on, thus insuring the effective use of these installations for years to come.

The big Marion shovel is equipped with a 150-ft boom and 92-ft handle, which will permit the discharge of spoil 290 ft from the point of loading up to a stacking height of 100 ft. The 16 motors add up to 4,650 hp with peak demand calculated at 6,840 kw on 7,200-v power. That's enough power to supply a city of 6,000 people, Mr. Reilly said, in making the point that all this is invested in producing a commodity that sells for less than 2¢ per lb. The unit will remove more than 90 ft of cover to expose a 4½-ft seam.

Eastern stripping began in earnest during World War I, Mr. Reilly related, but shortly after the war, quality of the product dipped, a number of firms went into bankruptcy and hard credit terms were the rule in the years that followed. However, operators in the Midwest stemmed the tide by pioneering in bigger shovels, higher capacity haulage units and coal washing. The Hanna organization stepped up from 8-yd to 16-yd to 35-yd shovels, then concentrated on lightweight bucket design to finally arrive at the well-known 50-yd units.

Turning to other developments, Mr. Reilly brought up the new coal pipeline, spanning 103 mi from the company's preparation plant at Georgetown to a power plant in the city of Cleveland. Propelled by pumping stations 35 mi apart, 150 tph of coal in a 50% water slurry (600 gpm) will pass through the line to be discharged into a dewatering plant where the coal will be recovered for steam raising and the water will be cleaned up for use in the plant. Velocity of the stream in the 10-in line, now under construction, will be about 3½ mph.

Purpose of the pipeline is to reduce transportation costs in coal shipping, and its successful operation may hasten the day when coal operators can say to competitive carriers, "Lay that pistol down, sir," Mr. Reilly said.

TRAINING FOR SAFETY

At the beginning of 1954, a total of 3,226 Illinois miners had received training in accident-prevention, Mr. Reak reported, in his review of training activities in the state. The results for one company showed that a record of 11 fatalities in 1953 was reduced to no fatalities in 1954 after 100% accident-prevention training had been given.

The need now is for follow-up training

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You buy more than high-strength anchors when you buy O-B shells and plugs for roof support!

You buy a fast bolting cycle, too, because these O-B units are easy to work with. They go on the bolt fast—no delays due to off-size threads. • They go up the hole fast—no hanging up half-way. • They tighten up fast—no falling out of the hole before tightening, no slipping or spinning in the hole during tightening. • They hold fast—four-way expansion of shell creates a powerful "socket" anchorage that's solidly backed up with heavy metal of the plug.

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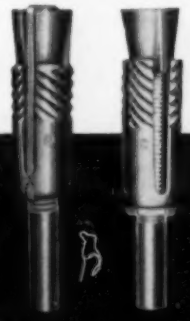

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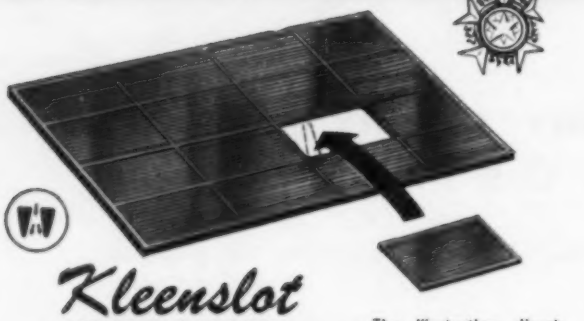

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PREPARATION SCREENS

On October 6, 1952 these Wedge Wire panels, as shown, were installed on a 6 x 16 Allis Chalmers low head vibrator. On April 30, 1955, after 7,836 hours of service they had processed 1,175,400 tons of 5" x ⅜" coal, 1.36 float material. These screens are still in service and are proof positive of the long life of KLEENSLOT Wedge Wire Screens.

The illustration directly above shows the location of the test screen that was removed for checking. The dotted lines on the diagram show the point where the rinse water from two different rinse boxes hit the screens. Send for our completely illustrated catalog today.

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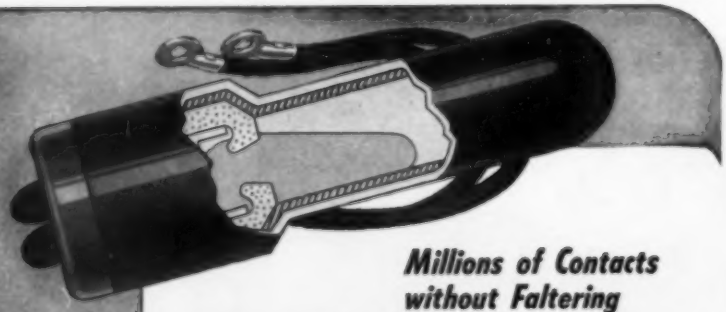

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after the formal training, Mr. Reak declared, in listing possible approaches, as follows:

Daily briefs on safety by supervisors to each employee.

Weekly safety talks on the first shift of the week on company time by union officials.

Monthly safety meetings among supervisors and the safety committee at which safety information and experience is exchanged.

Dissemination of safety newsletters, safety statistics and pertinent bulletins and posters.

Safety initiative must be taken by coal operators, Mr. Reak noted, but since the men have a great personal stake in safety, it becomes necessary for all to demand strict obedience to safety rules and to bring violators to account.

CONTINUOUS MINING PLANS AND MAINTENANCE

Leading off the panel presentation on continuous mining, Mr. McDaniel reported on how five Goodman boring-type machines are used in pillar recovery at Old Ben No. 9.

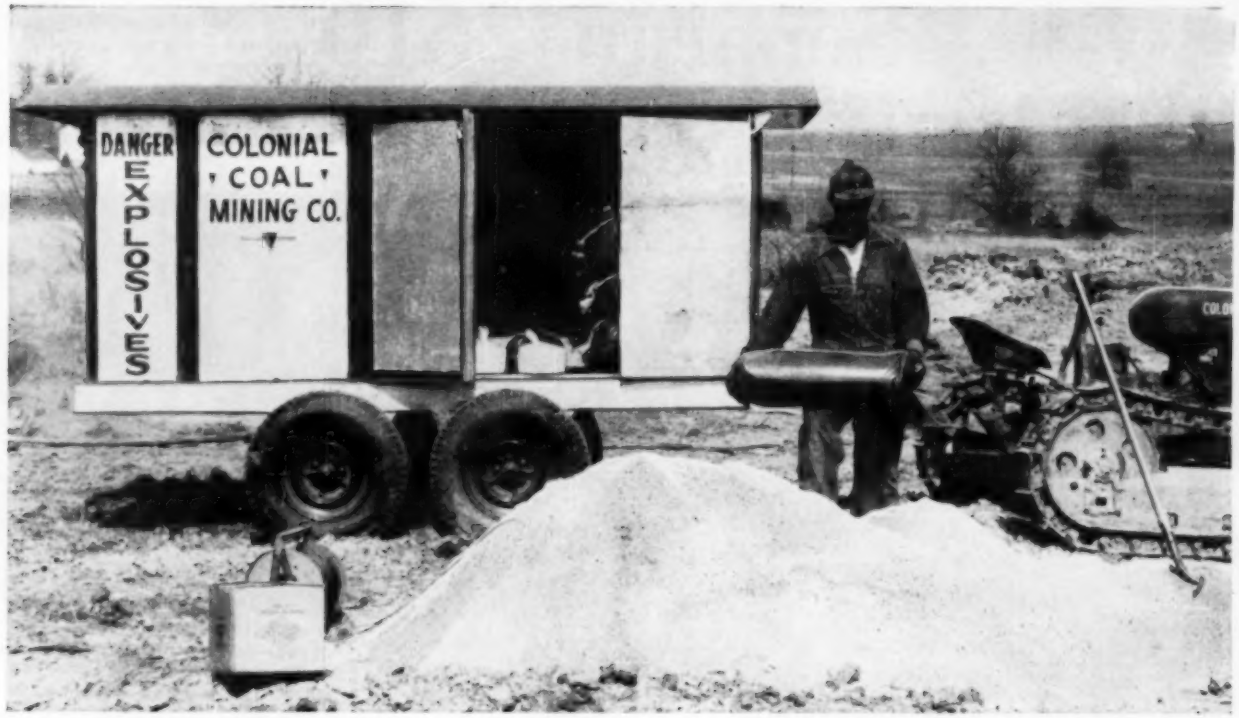
Panel entries consist of three headings 934 ft long measured from the four-heading cross entry. Room work, 24 rooms per panel, begins at the inby end of the panel by mining a pair of caving rooms on 18-ft centers to leave a 4½- to 5 ft pillar between the rooms. The rooms average 310 ft in length with crosscuts on 70-ft centers.

The narrow pillar is taken in retreating from the pair of rooms by breaking through each narrow pillar twice between each pair of crosscuts, leaving small stumps in advance of the machine. The next outby pair of rooms is driven to leave a 41-ft-wide pillar between the active rooms and the previously robbed pair. This wide pillar is extracted by turning stubs at 45 deg to the line of rooms on 25-ft centers during retreat. The stubs are 57 ft long on 18-ft centers, and the narrow pillars between stubs are removed by breaking through twice, leaving only protective stumps. Each machine works successive panels in a 4,000x800-ft block of coal in this manner.

Track and shuttle-car haulage is employed, using two cars per mining machine in development work and three in room-and-pillar work. Loading time per shuttle car in development is 2¾ min and in room work, 1½ min.

These methods of pillar extraction have produced desirable roof breaks which have prevented squeezes, Mr. McDaniel pointed out. Each crew includes eight men and a foreman for production of about 550 tons per unit shift.

Speaking on maintenance at Old Ben, Mr. Eubanks said that since each unit has a higher productive potential than conventional equipment it is vital to keep the continuous-mining machine in full operation. Furthermore, each machine represents a sizable investment, thus ruling out the purchase of spare machines. Between-shift maintenance is a must with mechanics requiring a full understanding of hydraulic, mechanical



How New Akremite Method Helps Us Cut Explosive Costs 40% to 60%

... main ingredient we use in new "make-it-yourself" explosive is Spencer Commercial Grade Ammonium Nitrate

By JAMES E. MINER, *President, Colonial Coal Mining Company*

THE "Do it yourself" fad is not restricted to the basement workshop as far as the Colonial Mining Co. is concerned. Strip miners of coal now are making their own explosive for overburden shooting.

Hugh B. Lee, president, and Robert Akre, superintendent of drilling and shooting, Maumee Collieries Co., Terre Haute, Ind., have developed a new type explosive for strip and open pit mining. Called the Akremite Blasting Process, Colonial Coal Mining Co. is now using the method under license from Maumee.

Drilling and shooting conditions will vary with each mine so that no rule of thumb can be used to show shooting costs. However, Akremite is saving us 40% to 60% compared with the cheapest commercial explosive and is giving at least equivalent results when shot on a pound for pound basis.

For a specific example of the savings, take our experience at Colonial Mine. We purchased a Bucyrus-Erie 50-R drill and began using Akremite about a year ago. For an 11-month period after using this combination we enjoyed an 18-cent per ton reduction in drilling and shooting costs over a like period before its use, while our stripping ratio was reduced by one yard, from 7½ to 1 to 6½ to 1. Depreciation of the drill is included in the calculations of cost.

The main ingredient in the Akremite Method is a commercial grade ammonium nitrate. We use Spencer Commercial Grade Ammonium Nitrate. A great deal of practical research has been done by the Spencer Chemical Company in cooperation with Maumee Collieries to produce this raw material with the proper moisture content, density, screen analysis, caking quality and ability to take the correct carbonaceous coating.

(NOTE: Spencer Chemical Company will be happy to provide you with further information about the Akremite Method as discussed by Mr. Miner.)

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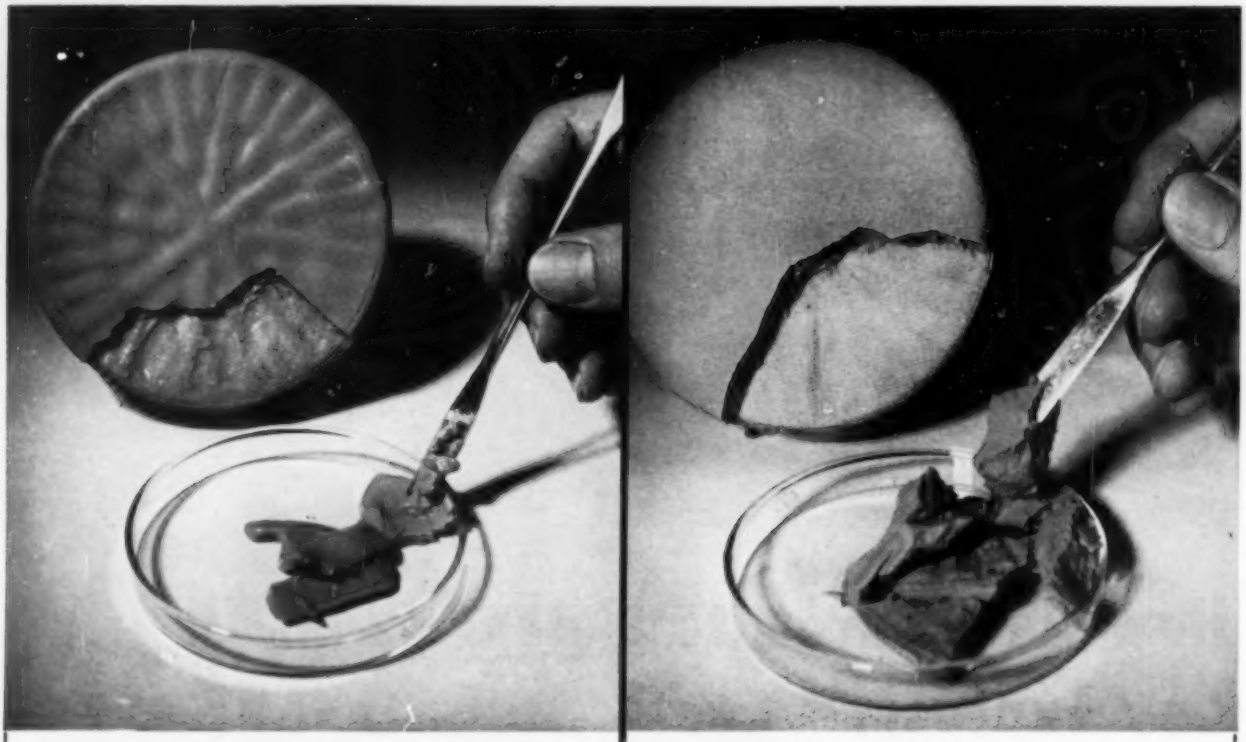

Above picture shows thin cake formed on filter with untreated solids. Cycle includes 15-second cake formation and 45-second drying time.

During the same cycle, a much thicker cake is formed by treating with 0.15 lb. of SEPARAN 2610 per ton of dry solids present.

New flocculating agent speeds up filtration and settling rates, brings many other improvements to liquid-solid separations

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Prove to yourself the advantages of Separan* 2610 in filtration.

1. Increased cake size
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- Iron Ore and Taconite
- Industrial Water, and Waste
- Miscellaneous Metals

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and electrical systems. One advantage of the machines at Old Ben, Mr. Eubanks said, is that any part may be removed at the face with a 2-ton hoist, a pipe hoist beam and roof-bolt anchorages.

Clean hydraulic oil is extremely important. Old Ben transports the oil in closed containers and uses 200-mesh filters on the pump intake with magnetic and other filters in the system. The electrical system is conventional and may be maintained by men who are familiar with the circuits on conventional equipment. All things considered, the new machines are producing coal more economically, maintenancewise, than conventional machines. On-shift downtime has not been excessive, and indications are that the machines will produce up to 300,000 tons per overhaul.

After recounting the history of the Marietta Miner, Mr. Conway noted its flexibility and its adaptability in bad bottom and on sharp turns. Pointing out that the Chicago, Wilmington & Franklin Coal Co., in southern Illinois, had taken active interest in the machine and had worked out many new developments on it, Mr. Conway summarized the use of the machine at Orient No. 3 mine (*Coal Age*, May, 1954).

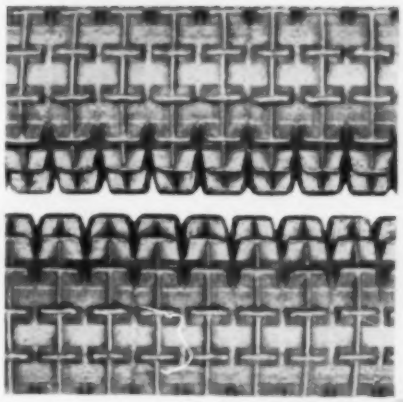
Next on the program was Mr. Stachura, relating Enoco's experience with AC-powered Colmols. The hardness of the Indiana No. 5 seam was a factor in a number of changes in Enoco's machines, including stronger steel in rotary arms and bit brackets, more support for the dozer blade, more fastenings on cover plates, and redesign of bits and bit holders. These changes have been incorporated in new models and have been added to units which have been overhauled at the mine. The hydraulic systems of the machines have performed very well, Mr. Stachura said.

Few electrical troubles have been encountered with the 440-v AC power system. Original trailing cables are still in use after 22 mo of service. Production is about 35 tons per man shift as a result of increasing operating time at the face from 3 to 5 hr per shift by adapting the machine to local conditions. Costs quoted by Mr. Stachura are less than 2½c per ton for parts and 7c per ton for bits.

One dark spot in the picture is size consist, which is not entirely satisfactory, but it is thought that a change to a larger throat and 30% less speed on the rotary arms may clear up the situation. Minus 28-mesh product is 11 to 13% in coal from solid work and 7% in coal from pillaring.

Winding up the round-robin on continuous mining, Mr. Canonico told of Compass' experience with a Joy extensible belt serving a Joy continuous miner. In driving pairs of rooms, Mr. Canonico said, a seven-man crew, including the foreman, moves the belt from Room 1 to Room 2 in 40 min and adds 100 ft of belt in 3½ min. Average advance, using a bridge-conveyor setup, is 125 ft per shift and the best shift so far is 171 ft.

In comparing shuttle-car haulage with extensible-belt transportation, Mr. Canonico reported that the average is 457



LESS FINES
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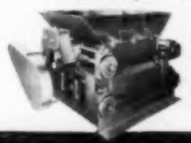
TOP SIZE

with Gundlach Patented Crusher Rolls

The chart at the right shows results of four different tests made with the Gundlach 2 Stage Crusher, using Southern Illinois Coal. Only with Gundlach patented crusher rollers could such percentages be realized. Let us demonstrate the Gundlach crusher at your mine . . . with your coal . . . with no obligation to you!



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SIZE OF FEED	6"x1¾"	6"x1½"	1"x3"	4"x1½"
CRUSHED TO TOP SIZE	1¼"	1½"	1¼"	1¼"
OVER-SIZE %	0	0	3.03	.64
STOKER REALI-ZATION %	91.64	88.30	81.84	82.30
CARBON (FINES) %	8.36	11.70	15.13	17.06

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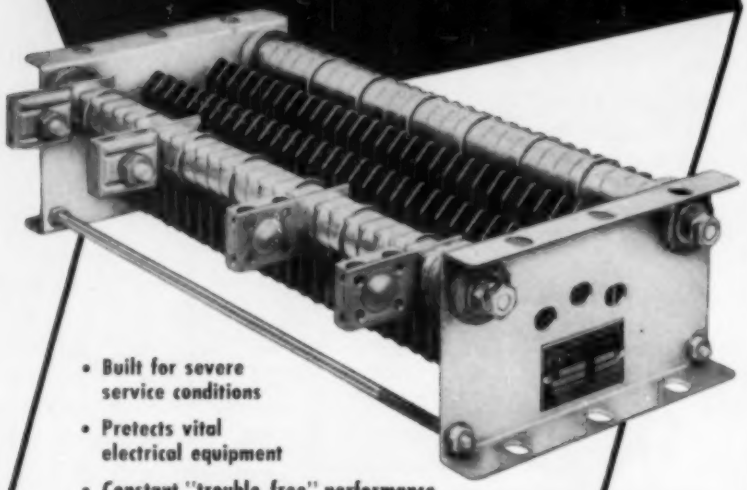

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These rugged nonbreakable units have proved their merit in all kinds of service for many years. Made of steel and mica, plus P-G unique and exclusive grid design, P-G Resistors are capable of protecting your most vital electrical equipment, even where service requirements are severe.

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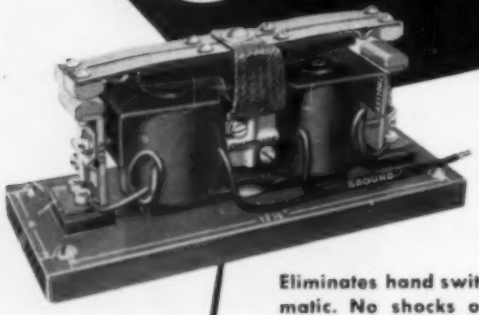

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tons per unit shift with the former and 562 tons per unit shift with the latter. Best shift with shuttle cars tallied 650 tons, and with the extensible belt, 831 tons. Crews in both instances consisted of 7½ men, prorating one mechanic for two units. In September, 1955, the extensible-belt unit averaged 600 tons per shift.

Size consist comparisons at Compass are as follows:

Continuous Mining	
Plus 2-in.	31.20%
⅜x2	43.10%
⅜x0	25.70%
Conventional Mining	
Plus 2-in.	30.10%
⅜x2	39.10%
⅜x0	30.80%

The secret is to crowd the face with plenty of power, Mr. Canonico informed the group.

New Books For Coalmen

Preventive Maintenance

Preventive Maintenance of Electrical Equipment, by Lt. Cmdr. Charles I. Hubert. Here is useful information for engineers, maintenance men and engineering students. Written in concise, simple style, the book is divided ito three sections on preventive maintenance, trouble-shooting and correct operating methods. Questions and answers provide a useful learning and teaching aid. *214 pp. 6½x9¼-in; cloth. $4. McGraw-Hill Book Co., 330 W. 42nd St., New York 36, N. Y.*

International Safety

Safety in Coal Mines, the second volume on safety published by the International Labour Office, Geneva, Switzerland, presents the most important safety provisions of the mining laws of a number of countries. Regulations are arranged by subject where possible and cross references are included where they apply to more than one division. *647 pp. 6¼x9½-in; paper. $3.50. International Labor Office, Washington Branch, 917 15th St., N.W., Washington 5, D. C.*

Lignite and Peat

Lignite and Peat, by staff, Div. of Solid Fuels, U. S. Bureau of Mines, is a chapter from Bulletin 556, Mineral Facts and Problems, and covers the occurrence, reserves, uses and outlook for lignite. Problems in production, preparation and utilization are pointed out. *12 pp. 8x10¼-in; paper. 10¢. Superintendent of Documents, Washington 25, D. C.*

Estimate of Known Recoverable Reserves of Coking Coal in Clearfield County, Pa., by D. W. Blaylock, J. J. Dowd, R. F. Abernethy and D. A. Reynolds. *R. I. 5166. 36 pp. USBM, 4800 Forbes St., Pittsburgh, Pa.*

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The National Merit Scholarship Corporation

Business is Offered Big Dividends on Investment in Higher Education

The McGraw-Hill Publishing Company is availing itself of the opportunity to establish ten National Merit Scholarships. They will be known as the McGraw-Hill Merit Scholarships. The scholarships are to be awarded to qualified candidates for a four-year college course in the fields of science, engineering and the other professions and the liberal arts. There will be no limitation, beyond the appropriate professional accrediting, on the college or university selected by a successful candidate. As part of a continuing program to aid higher education and educational institutions, McGraw-Hill is happy to be able to share in what it believes to be the constructive educational endeavor of the National Merit Scholarship Corporation.

Business firms searching for a satisfactory avenue to provide financial aid for our colleges and universities now have a new opportunity of major importance. It is provided by the National Merit Scholarship Corporation, which has offered to devote $8 million to matching, dollar for dollar, gifts by business firms for college scholarships and supplemental gifts to the institutions where the scholarships are used.

The National Merit Scholarship Corporation, an independent agency financed initially by gifts of $20 million from the Ford Foundation and $500,000 from the Carnegie Corporation, has three major purposes which are closely related. They are:

1. To locate those of the nation's young men and young women who are best equipped to go to college.

2. When necessary, to help these young people go to college by giving them financial aid.

3. To help colleges and universities meet the full cost of the instruction of those to whom National Merit scholarships are granted.

At present about half of the nation's top high school graduates do not go to college. The principal reason is that they do not have the money required.

To Save Unused Brain Power

The National Merit Scholarship Corporation will strive to eliminate this dangerous neglect of top-flight ability. To this end it is inviting the nation's high schools, numbering more than 24,000, to participate in its program by designating as available candidates for National Merit scholarships the top 5 percent of their senior classes. Those so designated are then invited to take a series of tests and to submit reports designed to assure selection of the very best talent in each state. The number of scholarships to be allotted to each state will be proportionate to the number of high school graduates in the state.

The winners, the total number of whom will be determined by the amount of money the Scholarship Corporation has available, will be eligible for awards. For those who need no financial help to go to college there will be honorary awards of $100. For those who must have help the Corporation will grant scholarships covering as much as necessary

of the cost of instruction and living expenses for a four-year college course.

Colleges Get Financial Help

The provision of funds to cover the students' expenses does not, however, solve the financial problems faced by many colleges. That is because the tuition charges paid by the students do not cover the cost of the instruction. The deficit must be met by drawing upon endowment funds, gifts, grants, and other available sources.

Consequently, to prevent holders of National Merit scholarships from imposing any additional financial burden on the colleges and universities they elect to attend, the Corporation will make a supplementary grant to these institutions. The supplementary grant will be the equivalent of regular tuition charges made by the school, with a top limit of $1,500 a year for both the tuition and the supplement.

As the scholarship grants to the winning students will vary, depending upon how much financial help they need, so will the supplementary grants vary from one college to another, depending on their regular tuition charges. However, it is anticipated that on the average the full cost of a National Merit scholarship—including aid to the student and the supplement to the college—will be about $1,500 a year.

Many business firms will find a compelling appeal in a program which is designed at once to mobilize the nation's intellectual resources more effectively and, in the process, give very badly needed financial help to our colleges and universities.

Two For One Return Offered

However, there are numerous other inducements to business firms to finance National Merit scholarships. These scholarships may:

1. Carry the name of the firm or be named in honor of someone designated by the firm.
2. Be limited to use in types of colleges of particular interest to the sponsoring firm.
3. Be limited to a college course, such as science, engineering or liberal arts, of special concern to the sponsor.
4. Be restricted to candidates or institutions in geographic areas specified by the sponsor.

In addition to these advantages there is a special financial inducement to help the Merit Scholarship program. It is that for every Merit scholarship a firm or individual finances, the Corporation will, up to the limit of $8 million, match the funds and make another National Merit scholarship available.

There are many good ways of helping our financially beleaguered colleges and universities, and many corporations are already using one or more of them.* For those companies that can do so without embarrassing complications one of the best ways is to make unrestricted gifts directly to the institutions. But this new way provided by the creation of the National Merit Scholarship Corporation (Address: 1580 Sherman Avenue, Evanston, Illinois) has the broad appeal of serving two purposes of transcendent importance simultaneously. The purposes are to see that our best brains are fully trained and utilized and that our colleges and universities, crucial contributors to this process, are helped at the same time. Business will serve the nation and its own community well by giving the National Merit Scholarship Corporation generous help.

---

* These, as well as the plight of our colleges and universities, are discussed in a pamphlet, "Business Aid to Our Colleges and Universities," which embodies a series of five editorials which appeared in all McGraw-Hill publications. Copies of the pamphlet can be obtained without charge by addressing the Department of Economics, McGraw-Hill Publishing Company, Inc., 330 West 42nd Street, New York 36, New York.

Methods of helping our colleges and universities financially are also outlined and discussed in a pamphlet, "Aids to Corporate Support of Higher Education," which may be obtained without cost by addressing the Council for Financial Aid to Education, 6 East 45th Street, New York 17, New York.

This message is one of a series prepared by the McGraw-Hill Department of Economics to help increase public knowledge and understanding of important nationwide developments that are of particular concern to the business and professional community served by our industrial and technical publications.

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Donald C. McGraw
PRESIDENT
McGRAW-HILL PUBLISHING COMPANY, INC.

Bulletins

(from p 124)

the Allis-Chalmers TS-360 motor scraper are outlined in catalog MS-663 by the Construction Machinery Div., Tractor Group, Allis-Chalmers Mfg. Co., Milwaukee, Wis. The scraper is powered by a 280-hp diesel and carries 20 cu yd heaped or 15 cu yd struck.

MAGNETIC DRUMS—Permanent magnetic drum applications and features are described in Bulletin MD-200 by the Homer Mfg. Co., Inc., Dept. 59, Lima, Ohio. Removers of tramp iron or ferrous material from gravity or conveyor transported products, the company's drums were designed to protect process equipment from tramp-iron damage and to concentrate magnetic materials from nonmagnetic.

TRUCK EQUIPMENT—A catalog describing dump bodies, hydraulic hoists, trailer dumps, hydraulic "LOAD-N-GATES" and special truck equipment has been printed by Hercules Steel Products Co., Galion, Ohio. Catalog 325 lists models, capacities and recommended applications. It covers Hercules' line of contractor, rock, excavator, "Morgantown" and platform bodies as well as underbody, front telescopic and dump trailer hoists. Also included are three

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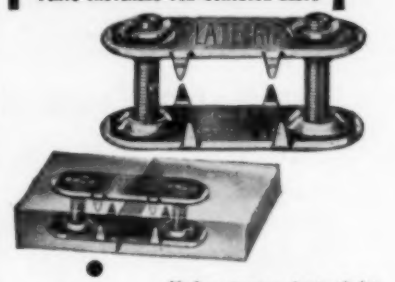

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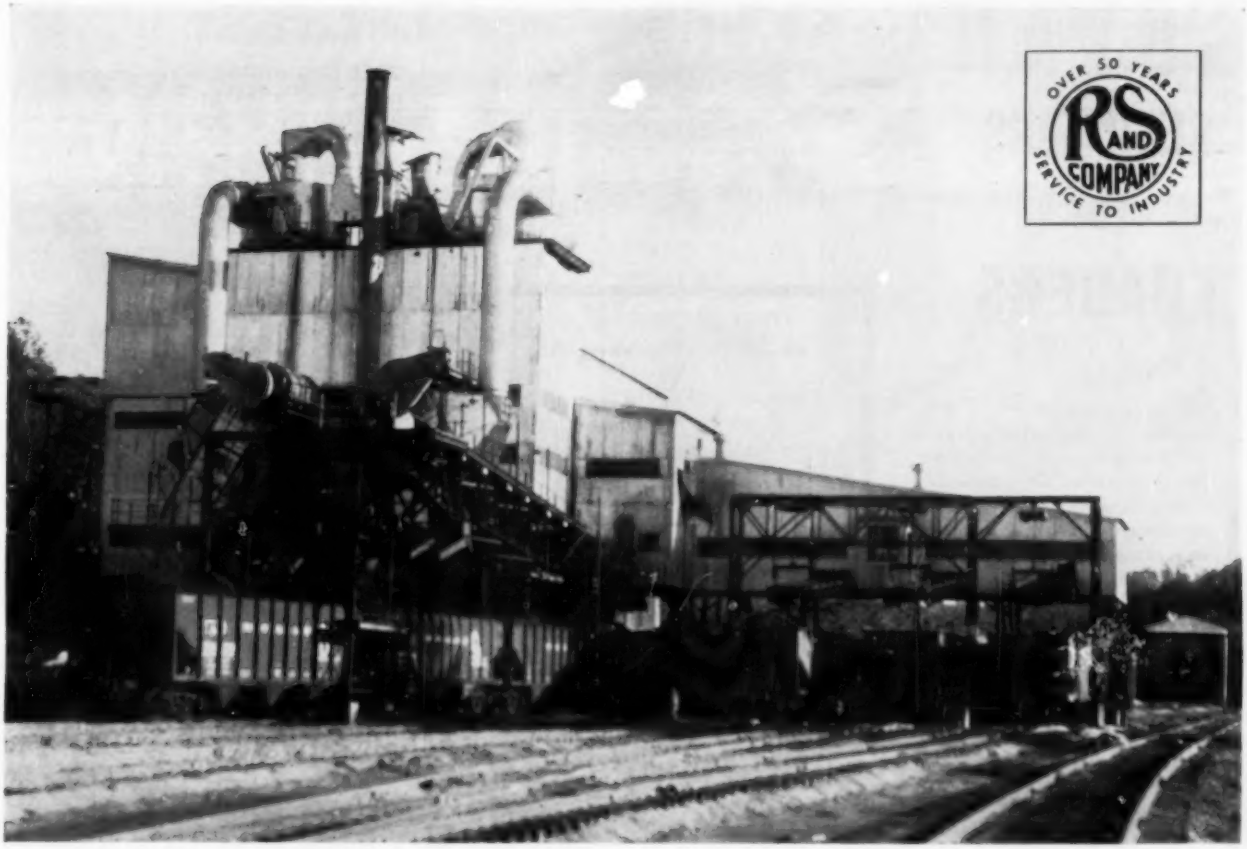

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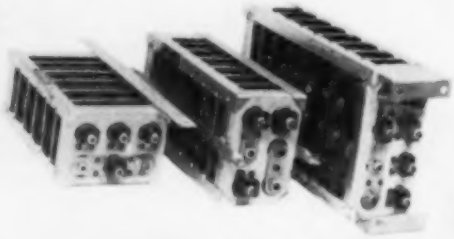

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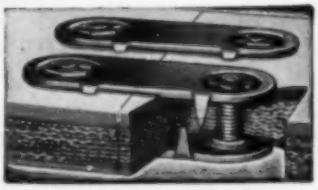

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TRACTOR SHOVEL—The engineering, design and production of the Allis-Chalmers HD-11G tractor shovel are described in catalog MS-460 by the Construction Machinery Div., Tractor Group, Allis-Chalmers Mfg. Co., Milwaukee, Wis. The catalog includes specifications and points out features that the company says mean easier servicing and less "time-down" in the field.

STANDARDS MANUAL—The Multiple V-Belt Drive & Mechanical Power Transmission Association and the Rubber Manufacturers' Association, Inc., has issued a 24-p revised edition of "Engineering Standards for Multiple V-Belt Drives." Data in the manual are based on latest engineering opinion and research, and suggests the proper sheaves and belts to attain optimum drive efficiency and economy for a particular duty. There are also 10 p of new horsepower ratings and ratings for belt speeds from 200 to 6,000 fpm. Copies from either the Rubber Manufacturers' Association, Inc., 444 Madison Ave., New York 22, N. Y., or Multiple V-Belt Drive & Mechanical Power Transmission Association, 27 E. Monroe St., Chicago 3, Ill.

NON-SHRINK MORTAR—A seven-step procedure for repairing concrete floors with a non-shrinking mortar is described in a folder by Master Builders Co., 7016 Euclid Ave., Cleveland 3, Ohio. The product, "Embeco Pre-Mixed" mortar, is ready-to-use and requires only mixing with water, according to the manufacturer, who adds that it will not shrink upon hardening as plain mortars do. Non-shrink mortar, the company says, bonds tightly to old concrete. And because iron particles serve as reinforcement, the hardened mortar is extremely tough, Master Builders declares.

VENTILATING FANS—A bulletin being circulated by the Chicago Blower Corp. describes a redesigned line of "Chicago Axial Airfoil" fans. Heavy-duty machines, they are designed in eight general categories for ventilating under all kinds of conditions. Developed after more than 50 yr of research, says Chicago Blower Corp., the fans provide high efficiency and low noise level and are sold with direct or V-belt drive. Bulletin AA-101 explains the fans' functions and designs in detail. Chicago Blower Corp., 9869 Pacific Ave., Franklin Park, Ill.

GENERAL EQUIPMENT—A condensed catalog, No. 5510, containing 50 pp of technical data, brief descriptions and photographs of vibratory equipment, feeders, conveyors, power tools, shaft seals, selenium rectifiers, gasoline hammer drills, electric hammers and other materials-handling equipment, is being distributed by Syntron Co., 975 Lexington Ave., Homer City, Pa.

BELT CONVEYOR IDLERS — E. F. Marsh Engineering Co., St. Louis 10, Mo., is distributing a catalog featuring information on the selection, application and mounting of its line of belt conveyor

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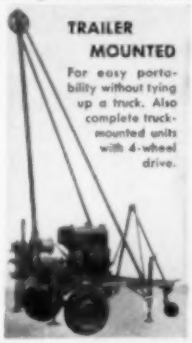

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idlers. The catalog includes specifications for nearly every idler in the bulk handling field. According to the company, the catalog will help to find an exact idler to meet normal or unusual needs, whether a frame is wood, channel or tubular construction.

LUBRICANTS – Bulletin 103A, a 4-p catalog of "Molykote" lubricants, has been printed by The Alpha Molykote Corp., 65 Harvard Ave., Stamford, Conn. The bulletin lists seventeen types of molybdenum disulphide lubricant and features an explanation of the importance of the compound in extreme bearing pressure, and in high, low and normal temperature lubrication application. Five new "Molykote" lubricants are listed.

PIPE TOOLS–A revised printing of a quick reference catalog is being distributed by Beaver Pipe Tools, Inc., Warren, Ohio. The catalog lists changes in Beaver's No. 17 lightweight ratchet threader, in its remodeled and redesigned Model-A high speed portable pipe machine, its power grip chuck "Quadra-Type" diehead, Model-D power drive and the new No. 78 "Quick-Opening Quadra-Type" threader. A new Beaver product, the "Speed-Cut" abrasive cutting machine, is featured on the back page. Two "Speed-Cut" models are being made, the No. 14 for leg or table use, and the No. 20 for use with a base.

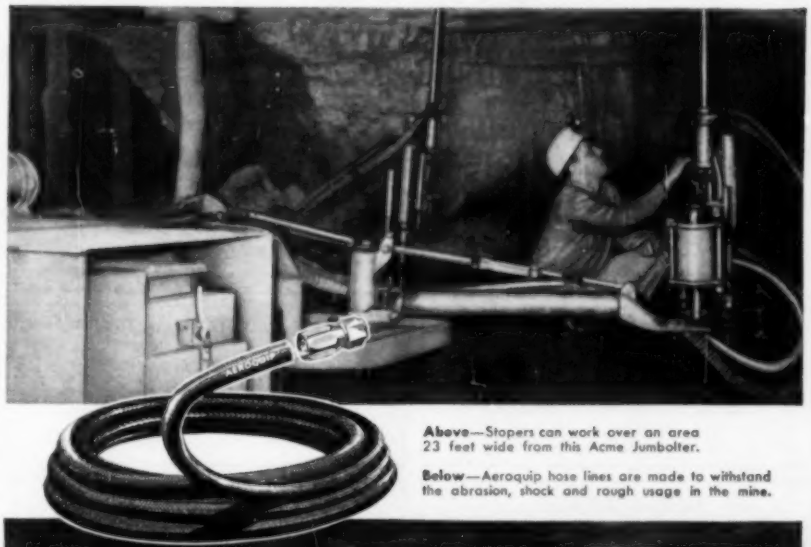
CAP LAMP–A brochure that describes the Edison R-4 electric cap lamp is being distributed by Mine Safety Appliances Co., 201 N. Braddock Ave., Pittsburgh 8, Pa. The lamp and a nickel-iron-alkali Edison battery are shown in photographs. A cutaway sketch illustrates the battery's construction. A disassembled headpiece is also illustrated to show the lamp housing, bulb assembly, reflector and bezel ring. One page of the brochure is devoted to battery charging equipment interchangeable with all three lamp distribution system: self-service, modified self-service and standard.

COAL MEN ON THE JOB

STANLEY PETROSKY, tipple day foreman, Ethel Chilton Mines, Inc., Ethel, W. Va.

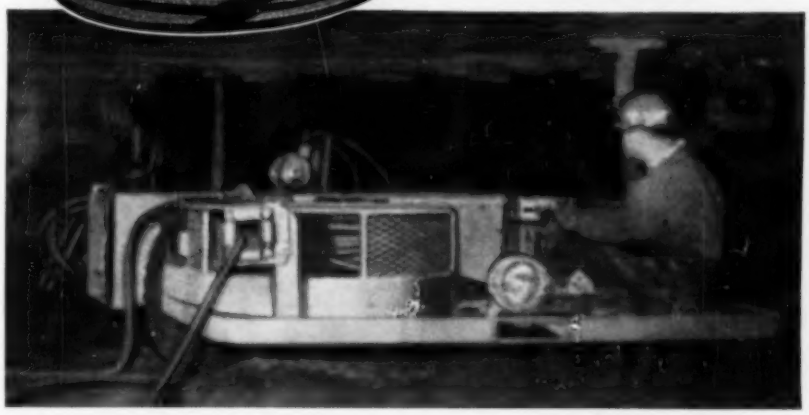
Aeroquip Flexible Hose Lines Replace Quicker...Last Longer

"WE USE THEM EXCLUSIVELY IN THE HYDRAULIC SYSTEM OF OUR JUMBOLTER", says M. H. Evans, Acme Machinery Co.



Above—Stopers can work over an area 23 feet wide from this Acme Jumbolter.

Below—Aeroquip hose lines are made to withstand the abrasion, shock and rough usage in the mine.



Aeroquip flexible hose lines are used for all hydraulic applications on roof bolting equipment produced by Acme Machinery Company, Williamson, West Virginia. Acme prefers Aeroquip because it withstands the flexing and abrasion encountered in stoping operations.

For equipment operators, Aeroquip speeds replacement of damaged fluid lines. The reusable fittings can be attached to a new length of hose with ordinary hand tools. Installation takes only minutes. For complete information, call the Aeroquip distributor listed in your Yellow Page Directory, or write us.

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TRACKLESS EQUIPMENT

(W) 1—12BU 9E Rebuilt
(C) 2—12BU 9E Rebuilt and AS IS
(C) 4—8BU As Is or Rebuilt, 500 volt
(C) 1—8BU Loader—Rebuilt & Ready
(W) 2—8BU 116, 220/440 volt AC
(C) 1—29U Rubber mounted—like new
(W) 4—Myers Whaley LS No. 3—Cheap
(W) 1—29U Lee-Norse Rubber Mounted
(C) 1—Joy Post Puller—Perfect
(W) 2—6SC Shuttle Cars
(W) 2—5SC Joy Shuttle Cars, Modern
(C) 2—32E-7 Joy Shuttle Cars
(W) 9—32D Joy Battery Shuttle Cars, Batteries & Chargers
(C) 2—Late Type Lee Norse Shuttle Cars, Elevating Discharge
(C) 1—T1-PE Joy Cat Truck—Good Condition
(C) 1—Goodman Cat Machine Truck, New
(W) 2—T2-5 PG, 220/440 volt AC Cat Trucks

CONVEYORS

(W) 3—61AM Jeffrey Room Conveyors
(C) 2—61MG Permissible Face Conveyors
(C) 4—20" Joy-Ladel Chain Conveyors
(W) 1—97 HCD Goodman Belt Drives
(W) 2—G15 Goodman Shakers
(W) 1—PT12 Long Piggyback
(C) 200—5" Conveyor Pans, 61AM
(W) 500—Column type troughs for G15 Shakers

CUTTING MACHINES

(W) 13—35B Jeffrey
(W) 4—212AA Baby Goodmans
(C) 4—12AA Standard Goodmans
(C) 3—12AB Goodmans
(W) 4—35L Jeffrey, Permissible
(W) 3—35BB, 50 h.p., Jeffrey
(W) 5—Sets 12AA Stub Axle Trucks
(W) 3—Sets 35B Tip-turn trucks, any gauge
(W) 3—512 Goodman, 250 volt DC
(W) 129U, track mounted, any gauge
(W) 4—7AU Sullivan cutting machines
(W) 2—Sets 112AA Stub Axle Trucks
(C) 4—11B Sullivans, 8' Bars, Permissible
(W) 2—7B Sullivans, 220/440 volt AC
(C) 3—112 G3 Goodmans, 220/440 volt AC
(C) 2—12G3, 220/440 volt AC Standard Machines
(C) 1—7AU, 42" t.g., good condition
(C) 2—35BB Jeffrey

LOCOMOTIVES & MINE CARS

(W) 1—MH100 Jeffrey, 42" t.g.
(W) 2—MH110 Jeffrey, 36" t.g.
(W) 7—823 G.E., 42" t.g.
(W) 1—822 G.E. 42" t.g.
(W) 2—803 G.E., 42" t.g.
(C) 2—902 Westinghouse, 42" t.g.
(C) 1—MH100, 42" t.g.
(C) 1—6 ton Vulcan Diesel Locomotive—Rebuilt.
(W) 200—44" t.g., end dump, wood cars, $55.00 each.
(W) 75—48" t.g. American Car & Foundry, 1-2-3 drop bottom.
(W) 100—42" t.g. end dump cars—Cheap
(W) 50—42" t.g., end dump cars, 22" high
(W) 50—36" t.g. Am. Car & Foundry, drop bottom
(W) 3—36" t.g. Battery Locomotives

TIPPLE EQUIPMENT

(W) 1—5' Narrow Shaker Screen
(C) 2—2 ton Boom Hoists, AC
(C) 1—42" Loading Boom
(C) 1—48" Loading Boom
(W) 9—Belt Conveyors—All lengths & sizes
(W) 9—Drag Conveyor—All lengths & sizes
(W) 1—30 x 60 Jeffrey single roll crusher
(W) 2—36 x 36 Jeffrey single roll crushers
(W) 1—30 x 30 Jeffrey single roll crusher
(W) 1—24 x 24 Jeffrey single roll crusher
(W) 1—24 x 20 Jeffrey Flextooth crusher
(W) 1—30 x 30 American Pulverizer
(W) 1—18 DR6 Gundlach Crusher

MISCELLANEOUS

(W) 1—Cantrell Air Compressor
(W) 3—Lee Norse Jeeps
(W) 3—6' Jeffrey Aerodyne Fans
(W) 2—35 h.p. Double Drum Hoists
(W) 1—150 h.p. Single Drum Hoist
(W) 1—25 h.p. Single Drum Hoist
(W) 1—50 h.p. Single Drum Hoist
(C) 1—10 h.p. Single Drum Hoist
(W) 1—400 amp., 250 volt DC Welder
(W) 300—ton rail, consisting of 40 lb., 50 lb., 56 lb. and 80 lb.
(W) 200—60 lb. single clip ties, 42" t.g.
(W) 2—12BU Joy Swivels and Booms
(W) 5,000—Pr. Angle & Splice Bars, 30 lb., 40 lb., 50 lb. and 80 lb.
(C) 25—2" and 3" pumps, with or without motors
(C) 2—572 CP Drills
(C) 3—A7 Jeffrey Drills
(C 1MSA Rock Duster, 20 h.p., track mtd.
(W) 6—Joy Mfg. Co. DC Battery Chargers, used to charge 2—48 MEG 90 volt shuttle car batteries.
(W) Transformers—5KVA to 100KVA, all voltages, 30 in stock, New and Used.
(W) 10—24J and 38J, 250 volt DC Motors—New
(W) Armatures—35B, 12AA, 803, 823, CE7, 12AA and 35B.
(W) $50,000.00 Miscellaneous Parts—one half Joy.

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New and Used
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1—Joy 14BU, 7BE Loader, 10 H. P., head motors.
2—Joy 14BU, 7BE Loaders, 10 H. P. motors.
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2—Joy 8BU Loaders.
1—Joy 3 JCM Continuous Miner, 34" high.
6—Joy 32E9 Shuttle Cars.
2—Joy 32D Battery Cars.
2—Joy 58C Battery Shuttle Cars.
2—Joy 56C Shuttle Cars, 250 volt DC.
1—Joy T-1 Standard Cat Truck.
1—Joy T-2-S Cat Truck, AC.
1—Joy Ladel MTB 30", 40 H. P. tandem drive 2000' Belt Conveyor.
2—Joy PLII-14 Elevators on rubber.
1—Joy PLII-7E Elevator.
4—Joy 11B Cutting Machines, like new.
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4—Goodman 512 Cutting Machines with Bugdusters.
8—Goodman Machines on cats, 31" high. All hydraulic.

LOCOMOTIVES

3—Jeffrey 20 ton, type MH-110.
1—Jeffrey 13 ton, type MH-110.
3—Jeffrey 10 ton, MH-78, 42" & 44" Gauge.
8—Jeffrey 8 ton, type MH-100, 42", 44" and 48" Gauge.
12—Jeffrey 6 ton, type MH-80, 42", 44" and 48" Gauge.
7—Jeffrey 4 ton, type MH-96, 42", 44" and 48" Gauge.
3—G.E. 4 ton, type 825 Locomotives, 26" high.
10—G.E. 6 ton, types 801, 803, 821 Locomotives, 42", 44" and 48" Gauge.
1—G.E. 8 ton, type 822 Locomotive, 44" Gauge.
3—G.E. 10 ton, type 809 Locomotives, 42", 44" and 48" Gauge.
8—Goodman type 53, 6 ton, 44" and 48" Gauge.
2—Goodman 8 ton, type 32A, 44" and 48" Gauge.
2—Goodman 13 ton, type 29A, 44" and 48" Gauge.
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1—4' x 10' Robbins Gyrex Vibrator.
Feeders, Drags, Conveyors and Loading Booms.

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6—Jeffrey 35L's, like new.
3—Jeffrey 35B's, and 35BB's.
2—Jeffrey 29B's on track.
1—Jeffrey 29L, track mounted.
2—Jeffrey 29C's, track mounted.
4—Baby Goodman 212's, rebuilt.
3—Goodman 312's, 18" high.
3—Goodman 412 Cutters, 18" high.
4—Goodman 512's, hydraulic, with bugdusters.
15—Goodman 12AA's and 112AA's.
10—Goodman 324 Slabbers.
1—Goodman 224 Slabbers.
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20 Joy Loaders, all types.
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3—Jeffrey L-500 Loaders.
2—Goodman 360 Loaders.
4—Myers Whaley No. 3 Automat Loaders.
4—Clarkson Loaders.

CONVEYORS

10—Jeffrey 61 H.G. Faze Conveyors.
2—Jeffrey 61 AM Room Conveyors, 330 ft.
2—61 EW Elevating conveyors.
2—61 WH 15" Room Conveyors.
3—Joy 30" Belt Conveyors. 10 to 40 H. P.
4—Joy Ladel UN-17 Shakers.
10—Goodman G-12½ and G-15 Shakers.

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3—100KW, G.E. TCC-6's, 250 volt Rotary Converters.
3—150KW, G.E. HCC-6's, 250 volt Rotary Converters.
1—200KW, G.E. HCC-6 Rotary Converter.
1—Allis-Chalmers 200 KW Rotary Converter.
1—500KW, Westinghouce Rotary Converter.
1—600KW, G.E. Rotary Converter.

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1—200KW MG Set, Westinghouse.
1—300KW MG Set, Westinghouse.
1—Cummins 125KW, 250 volt DC.
1—GMC 671, 75 KVA, 220/440 volt AC.
2—Superior 100 KW, 250 volt DC.
1—Allis Chalmers, 200 KVA, AC (Natural Gas).
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Complete steam plant, will sell all or any part.
Boilers, like new. 1100 H.P. 500 H. P. Transformers, Turbines, etc.

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1—MSA low pessure Room Duster.
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400 Mine Cars, Drop Bottom and End Dump, all gauges.
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IN REBUILT AND SLIGHTLY USED EQUIPMENT

4—Late type 660-BH Goodman Loading Machines, 34" high, full hydraulic, each with one 10 HP drive and one 10 HP conveyor motor, 250 V, permissible type.
5—Goodman 570 late permissible type Shuttle Cars with 10 HP drive motors, permissible type, 4-wheel drive, 4-wheel steer, elevated discharge, full hydraulic, airplane brakes, no spin differentials, 36" high, new in 1952.
1—42" Belt Conveyor, 750' centers, Timken bearing carrying and return idlers, 7-ply Goodyear belt, 125 HP explosion-proof 440 V motor and contactor controls, speed reducer, and all necessary appurtenances.
2—JCM2E Joy Continuous Miners, 250 V, permissible type.
4—Late type Joy 11-BU Loading Machines, 250 V, permissible type.
4—5-SC Joy Shuttle Cars.
6—42E9 Joy Shuttle Cars.
5—Jeffrey 29-U Cutting Machines.

LOCOMOTIVES

1—20-ton Jeffrey MH-77, complete with air brakes, sanders, contactor control.
5—15-ton Jeffrey MH-77.
3—15-ton Jeffrey MH-110.
5—8-ton Jeffrey MH-100.
All equipped with 250 V ballbearing motors. Are now 42" gauge but can change to meet your gauge requirements. All have been completely rebuilt from one end to the other.
50—Practically new 7-ton all steel Sanford-Day Drop Bottom Mine Cars, 48" gauge.
300—Sanford-Day Rotary Dump Mine Cars, all steel, 42" gauge.
5—300 KW G.E. Rotary Converters, Type HCC-6, Form P, 1200 RPM, 250/275 V DC. switchboards and switchgear, including three single phase transformers, 60 cycle, 2300/4000 V AC.
1—Practically new 300 KW Westinghouse Synchronous Rotary Converter, 1200 RPM, 250/275 V DC, with three single phase, 60 cycle, 2300/4000 V transformers, switchboards and all necessary switchgear. Completely rebuilt by G.E. Service Shop at Cincinnati. New commutator, new brushes and bearings. Like new.
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Several single and double drum slope, shaft and drift Hoists complete with 400 HP to 1000 HP 2300 and 440 V motors. Complete specifications on request.

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FRANK J. WOLFE PHONE L.D. 34 SHELDON J. WOLFE
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S.A.E. SPECS. 1045

Length:	Diameter:
16'9"	4⅞"
18'	8"
16'	8"

Quantity available. Flanged both ends.

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2—D-8 Cable Bulldozers
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Lima 802 Shovel-Dragline Combinaation with GM Diesel Engine & swamp pads
Cat 12 Grader

This equipment can be seen working in Southern Tennessee, all in excellent condition, available immediately. Contact

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LOCOMOTIVES

1½ to 10 Tons 18" to 56½" Track Gauge.

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Marion 34 Yd. Electric type Strip Shovel
W.S.M. Hoist—Coal or Ore swt.—450 HP—Single Drum 12"x13"—Wraps 12000'—1¾" Rope.
5000—U.S. Std. Ties #3—42" ga.—40# rail—New.
5000'—#8—2 Conductor—Concentric Cable, New.
Manitowoc 4500 Drag 120' B. 6 Yd. #397 "Cat." E. McCarthy 36"-42" Dia. Coal Recovery Auger Diesel.
Jeffrey 29 V Cutter—on Cats.
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1—Beaumont Coal Crusher—Double Roll 28" x 32"—gear driven—spring relief—reciprocating feeder, hopper. Like new condition.

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EXCELLENT CONDITION

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Belt Width	Length of Conveyor	List Price	Sale Price
18"	25'	$1327.	$ 739.
18"	45'	1986.	1085.
20"	45'	2122.	1145.
20"	60'	2689.	1426.
24"	25'	1428.	835.
24"	45'	2227.	1237.
30"	25'	1535.	915.
30"	65'	3349.	1856.

For conveyors longer or shorter than those listed above, add or deduct the following per foot prices according to belt width. Prices include belting.

For 14" belt, $15.66 per foot
For 16" belt, 16.78 per foot
For 18" belt, 17.20 per foot
For 20" belt, 18.95 per foot
For 24" belt, 20.66 per foot
For 30" belt, 23.02 per foot

NEW CONVEYOR BELTING Save 25%

Heavy duty 4-ply, 28 oz. duck, ¼" top rubber cover x 1/32" bottom cover rubber belting having high tensile strength, tough cotton duck, strong carcass and proper flexibility. For heavy boxes, bags and bulk materials. Troughs easily. Famous brands at deep cut prices. Fresh stock.

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20"	4.69 foot	3.69 foot
24"	5.55 foot	4.14 foot
30"	6.77 foot	5.06 foot
36"	8.01 foot	6.00 foot

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NEW IDLERS & RETURN ROLLS 25% Below List Price

3-roll, 5" diameter Troughing Idlers for

18" belt	$19.00	30" belt	$20.50
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300 K.W. Westinghouse consisting of: Motor 432 H.P. synchronous, 2200 volts; Generator 275 volts, D.C., 1090 Amps. Complete with starting equipment.

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4—42T Bucyrus Diesel Drills with leveling jacks. Serial #31503, 41687, 41689, 63966
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Water Level Capacity 142.2 Cu. ft.
Door Opening Sequence 1-2-3

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1—Jeffrey 20 HP box car loader
2—Red Devil portable loaders, 12" x 15"
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1—Card Rotary car dumper, 13'x15' platform

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1—20 HP Vulcan, single drum
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16—Sullivan CE7
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1—51'x48" Card
1—73'x30"
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2—7 ton General Electric, 36" ga.
3—8 ton Ironton, 36" ga.
2—8 ton General Electric, 36" ga.
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What can your firm d
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slums is such a big job
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ness and many others.

Some slums should
made. Others can be
to better living standa
every sound program
all our people.

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There is a new national, non-profit organization called A.C.T.I.O.N.—The American Council To Improve Our Neighborhoods—which is designed to help all individuals or groups interested in putting America's house in order.

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Of our country's many million homes, more than 1 out of every 10 are out-and-out slums. Nearly one-half of all American dwellings are in poor to "fair" condition, and urgently need basic repairs.

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Your firm is certainly dependent on the welfare of the community where you do business. But it's more than good business—it's good citizenship to take part in efforts aimed at civic improvements. It's the *responsibility* of every business.

What can your firm do? The answer to America's housing problems starts with individuals. But to roll back slums is such a big job it's going to take more than individual effort. It will need the cooperation of your business and many others.

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There is a new national, non-profit organization called A.C.T.I.O.N.—The American Council To Improve Our Neighborhoods—which is designed to help all individuals or groups interested in putting America's house in order.

Send for a free copy of "ACTION." It explains what A.C.T.I.O.N. is and proposes to do. It lists booklets, research, check-lists, and other material which can help you. Address P. O. Box 500, Radio City Station, New York 20, N. Y.

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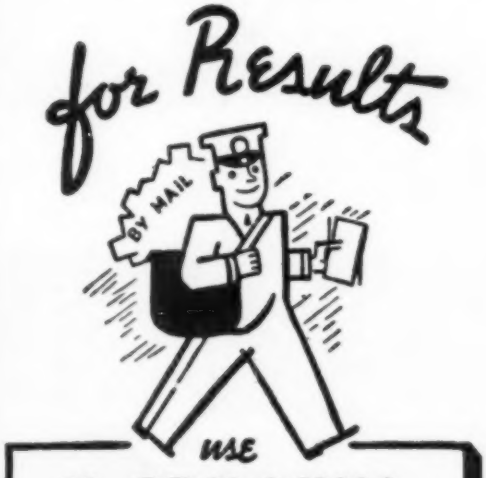

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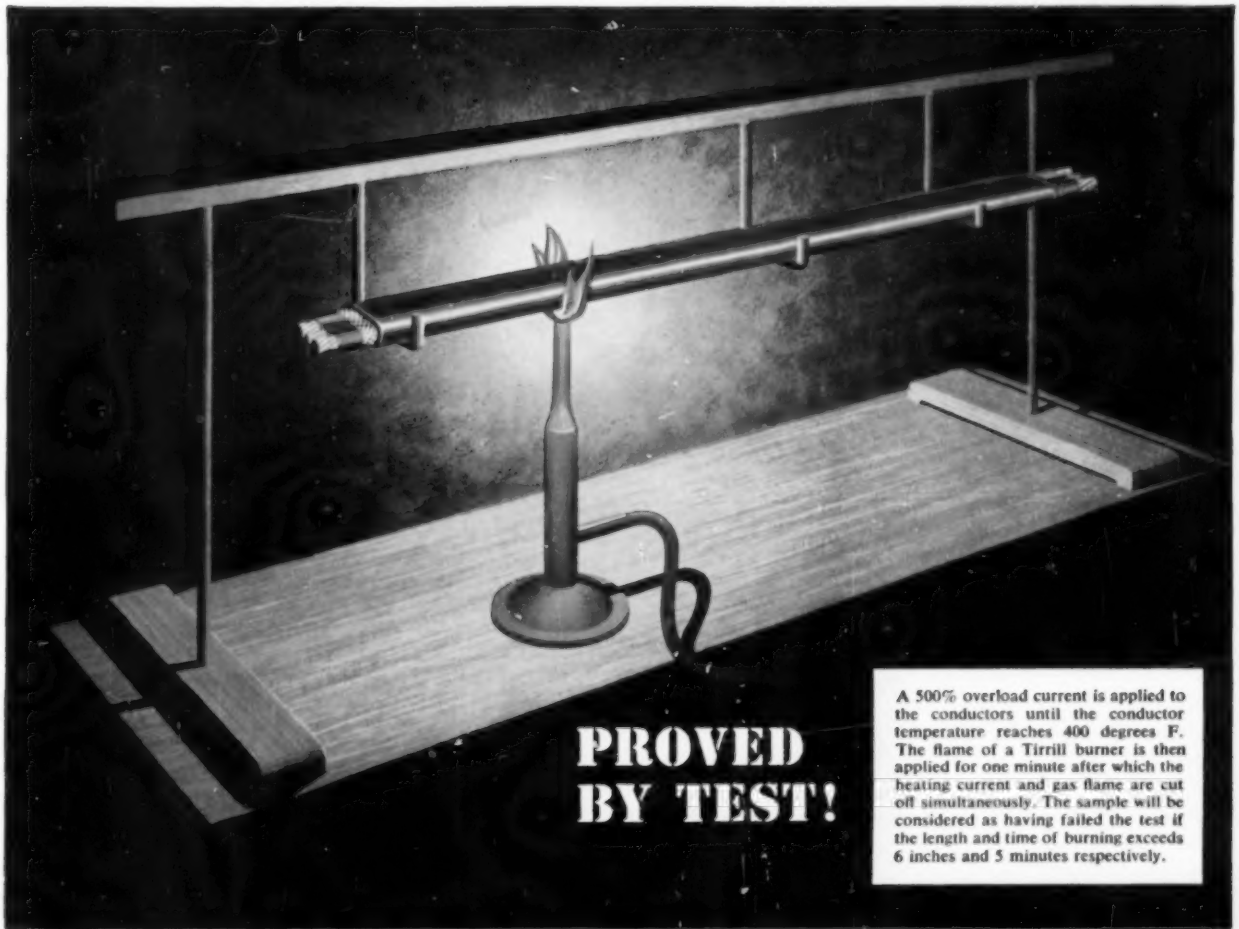

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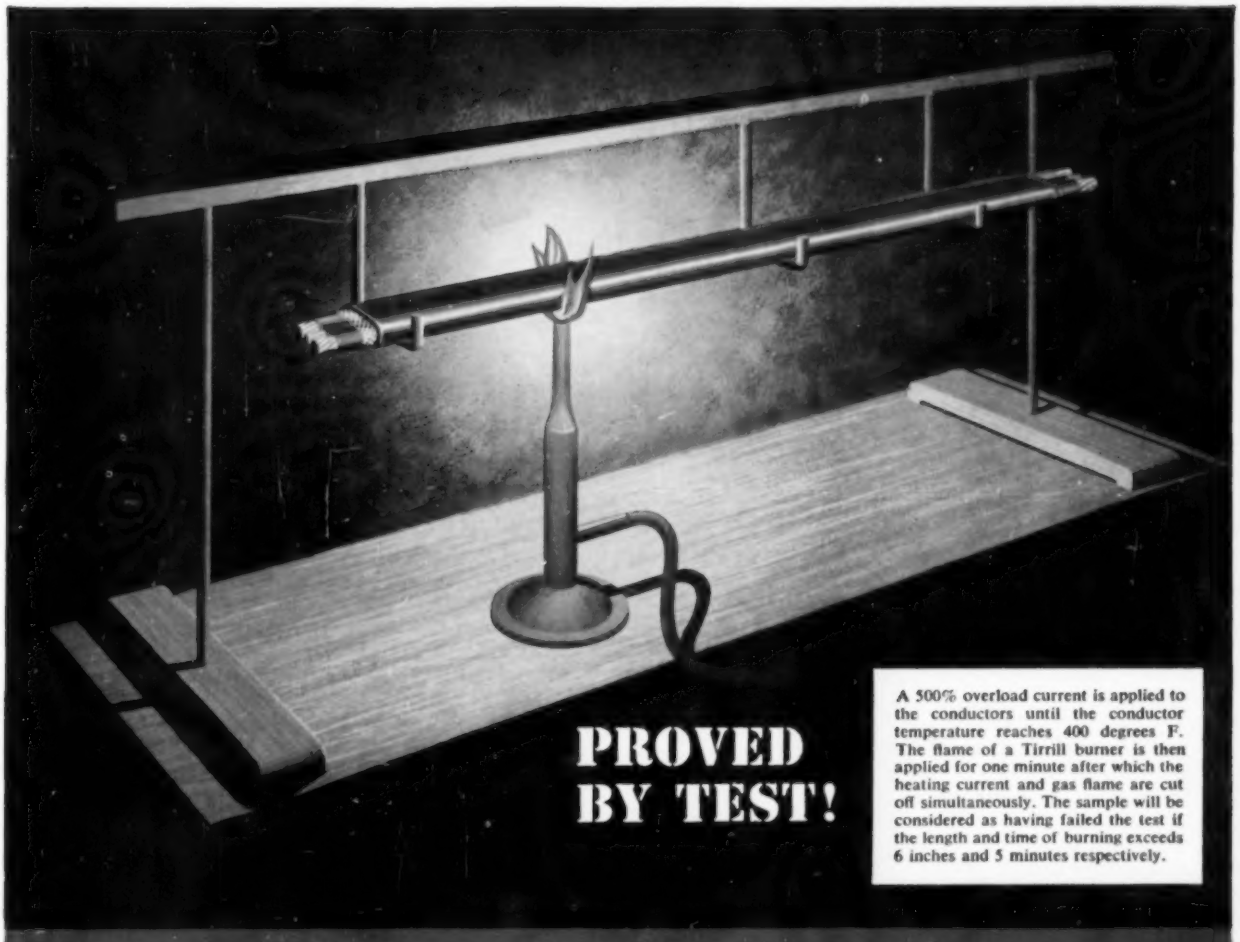

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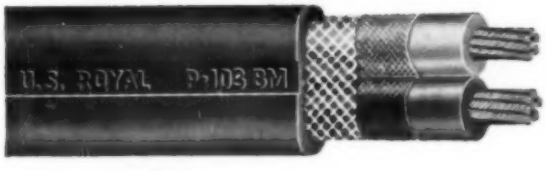

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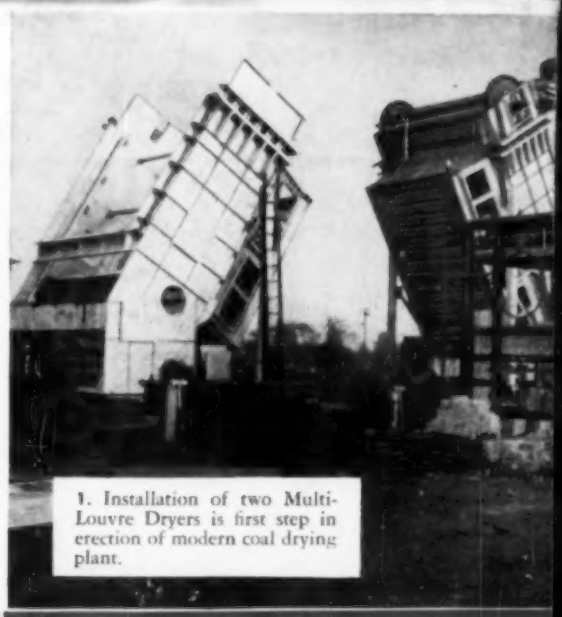
more coal operators depend on LINK-BELT MULTI-LOUVRE than any other dryer!



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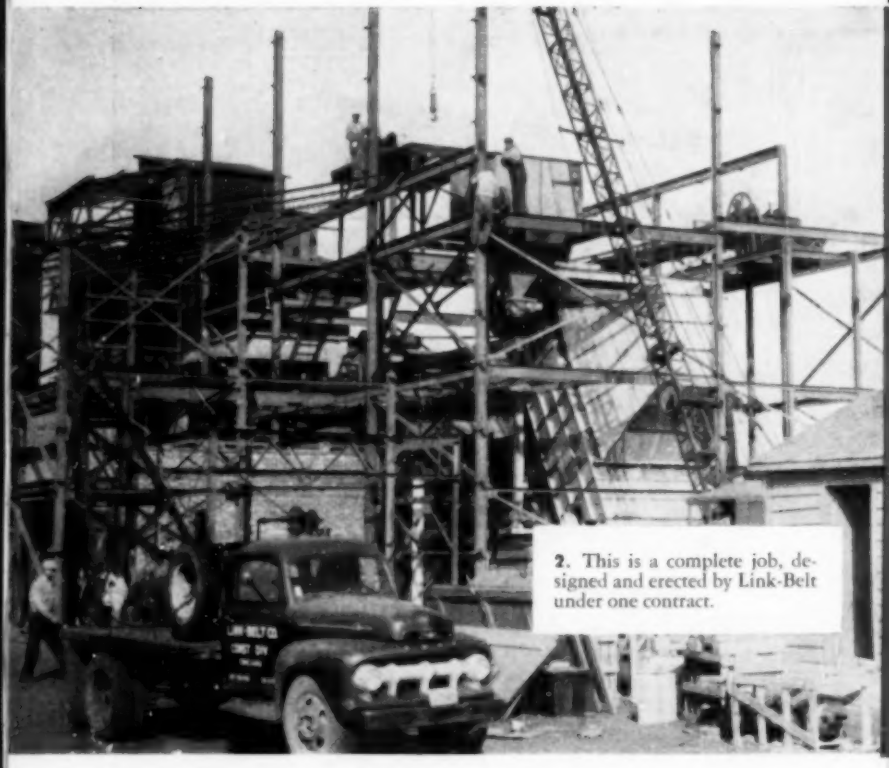


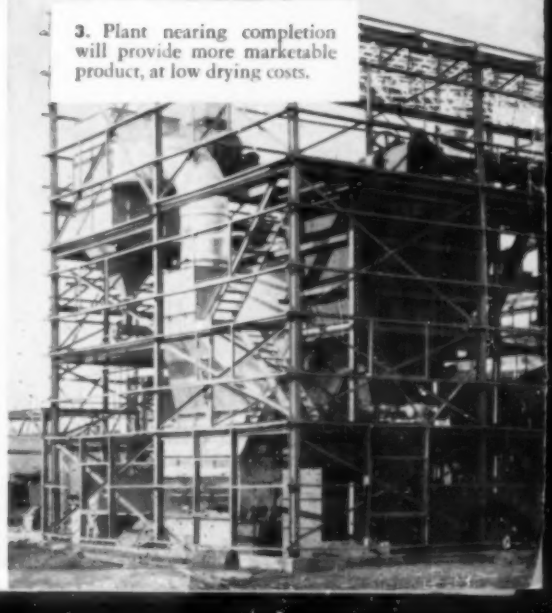
2. This is a complete job, designed and erected by Link-Belt under one contract.

- **Handles all sizes, up to 1½ in.**
- **Lower product temperature prevents oxidation — dried coal is 100° to 120° F.**
- **Minimizes explosion hazards — low air velocities reduce dust in air stream**
- **Lowers power consumption up to 50% — less horsepower needed**
- **Reduces maintenance costs due to simple design**
- **Lessens dusting and degradation because of gentle action of coal bed**

THE widely recognized superiority of the Link-Belt Multi-Louvre Dryer has made it the prevailing choice of the coal industry. In handling coal from 1½ in. to minus 28-mesh, it dries and cools with practically no degradation. Multi-Louvre's unique design permits low air velocity through the coal bed . . . reduces dust in the exhaust air stream . . . avoiding explosion hazards.

Equally important are Multi-Louvre's accurate, automatic controls which maintain low inlet air temperatures, prevent oxidation and insure uniform moisture reduction. What's more, with this efficiency you get substantial power and maintenance savings.

Learn how you can dry up to 150 tons of coal per hour with one Multi-Louvre Dryer. Call your nearby Link-Belt office or write for Book 2409.



3. Plant nearing completion will provide more marketable product, at low drying costs.

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